Mariners Weather Log

Vol. 49, No. 2 August 2005

This collage was designed with images courtesy of the National Oceanic & Atmospheric Administration (NOAA) Photo Library, Historic NWS Collection. The images were provided by the *M/V Noble Star* during a North Pacific Storm in the winter of 1989.

For more information on how National Marine Forecasts compare to observed seas, see the article on page 4.

Mariners Weather Log

ISSN 0025-3367

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Welcome once again to another issue of the Mariners Weather Log (MWL). I hope y'all are enjoying the summer season as much as we are down here on the Gulf Coast. Just when you think that you can relax a bit, unexpected visitors like Cindy, Dennis, and Emily come a callin'. Oh well, at least we don't have snow days... Wait – didn't Galveston have a white Christmas recently? This is getting confusing.

Well, here's something that is easy to understand. We have some great stuff to share in this issue of the MWL. The Tropical Prediction Center offers us an outstanding article about how your manually observed wave heights are critical to their computer forecasts. We also have some late changes to the Pt. Reyes facsimile broadcast scheduling and some news about upcoming changes to the AMVER/SEAS software. A new section that we have just added to the MWL is a feature I call "From the Desk of a PMO." Each of our Port Meteorological Officers (PMOs) are taking turns and offering us some news, facts, or just some sea stories from their part of the VOS program. The first victim …err, volunteer, is the one and only Timothy Kenefick. Tim is our PMO in Charleston, SC and being as shy as he is, it was a little hard to get him to speak up and tell us about his world. We also have pages of photos showing the proud faces of all the hard working masters and mates who were recipients of our annual award. I really do appreciate all the effort that each crew member does for this program and the efforts of each and every PMO in trying to keep them all supplied, trained, and happy. One minor correction from last issue though. I erroneously let a typo go by that gave an annual award to the ship DISCOVER DEEP SEAS. My apologies to the master and mates of the DISCOVERER DEEP SEAS for this lack of attention to detail. The echoes of my old Chief are once again ringing in my head, "Attention to Detail Nugget, Attention to Detail…" Oh make the nightmares stop…

I hope you find this issue as exciting to read as it was to produce, so grab a nice hot cup of coffee and enjoy!

Best Regards - Luke ⚓

Some Important Web Page Addresses

NOAA	http://www.noaa.gov
National Weather Service	http://www.weather.gov
National Data Buoy Center	http://www.ndbc.noaa.gov
AMVER Program	http://www.amver.com
VOS Program	http://www.vos.noaa.gov
SEAS Program	http://seas.amverseas.noaa.gov/seas/seasmain.html
Mariners Weather Log	http://www.vos.noaa.gov/mwl.shtml
Marine Dissemination	http://www.nws.noaa.gov/om/marine/home.htm
U.S. Coast Guard Navigation Center	http://www.navcen.uscg.gov/marcomms/

See these Web pages for further links.

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Expecting the Unexpected Wave: How the National Weather Service Marine Forecasts Compare to Observed Seas

Robbie Berg and Jamie R. Rhome , Tropical Analysis and Forecast Branch, NOAA/Tropical Prediction Center/National Hurricane Center

Introduction

Marine forecasts issued by the National Weather Service (NWS) provide the sea state in terms of the significant wave height (Hs). This value is defined as the average of the highest 1/3 of the waves observed in a wave field. In other words, if a mariner were to observe the passage of 100 individual waves past a given point, the significant wave height would be the average height of the highest 33 waves. The concept of significant wave height was derived during a project to forecast ocean wave heights and wave periods during World War II (Stewart 2005). The Scripps Institute of Oceanography has shown that observed wave heights correspond to the average of the highest 20-40% of the waves, and the significant wave height has evolved to become the highest 1/3 of the waves (Wiegel 1964).

The significant wave height tends to be the height of the waves that is most readily observed by the human eye (WMO 1998). But how does this value compare to the average height of all the observed waves, or the highest wave one might encounter? Unfortunately, misunderstanding of the meaning of significant wave height often leads to improper interpretation of the NWS marine forecasts. Additionally, confusion surrounding the proper measurement of significant wave height leads to subjective and widely varying wave height reports from ships since every mariner would most likely report different wave height values for a given sea state. This is often exacerbated by the fact that observations are dependent on the size of the vessel and the height at which the observation is taken. For example, observations of significant wave heights taken on the main deck of a large ship 80-100 feet above the water often cause the waves to appear smaller than reality. Similarly, a small vessel encountering rough seas may overestimate significant wave height or report only the highest individual waves (WMO 1998). This subjectivity results in vastly different reports of significant wave height from adjacent ships, forcing marine forecasters to speculate as to which report best represents the prevailing sea state. Accurate sea height estimates are critical to the accuracy of the NWS marine program. Accordingly, this paper seeks to provide additional insight into the term significant wave height and its relationship to other wave statistics.

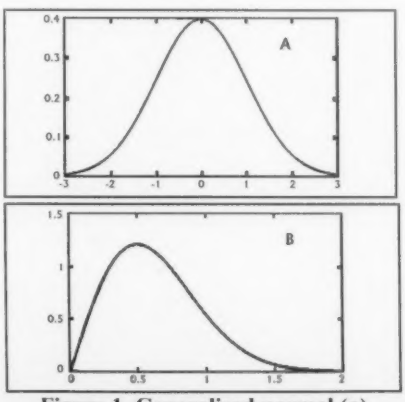

Figure 1. Generalized normal (a) and Rayleigh (b) distributions.

Significant Wave Heights

If a NWS forecast calls for seas 12 to 14 feet, exactly how will the wave field look to a mariner? To better understand what the significant wave height is and what it means to the mariner, we need to turn to statistics and the concept of distributions. Most people are aware of statistical distributions and probably don't even know it. The most common distribution used in real life is the normal, or Gaussian distribution (***Figure 1A***), which is more commonly referred to as the bell curve because of its shape (Wilks 1995). This distribution is quite good at describing phenomena in which most elements in a group are clustered near an average value with an equal number of elements being greater and less than this average value. Examples include the high temperature in a city for a given day, the weight of babies born at a hospital, or the height of students in a college oceanography class.

Wave heights in the ocean are usually modeled according to another statistical distribution called the Rayleigh distribution (***Figure 1B***). This distribution also has an average value, but in this case most elements are clustered toward lower values, with only a few exceptionally large values. The Rayleigh distribution does not exhibit symmetry like the normal distribution (Wilks 1995).

Several different wave statistics useful to the mariner can be inferred from the Rayleigh distribution. For example, the highest point of the distribu-

tion can be thought of as the most frequent wave height observed in the wave field. Roughly speaking, the most frequent wave height Hf is approximately half the value of the significant wave height (see Appendix). Similarly, the average wave height, which will be slightly larger than the most frequent wave, is estimated to be about 5/8 the value of the significant wave height (see Appendix).

Several recent marine incidents have highlighted the importance of knowing the height of the largest wave that can be expected for a given wave forecast. Since the Rayleigh distribution actually goes to infinity to the right of its peak, a wave is theoretically not bounded by a limiting height. This is where the Rayleigh assumption breaks down. Luckily, however, the highest waves can still be estimated through a combination of several methods. For example, it can be shown that 10% of the waves have a height greater than 1.074 times the significant wave height, and the average height of those highest 10% of the waves is approximately 1.272 times the significant wave height (see Appendix). ***Table 1*** shows the relationship between the multiple wave statistics for several common significant wave height forecast values.

In a somewhat tedious process, the above information can be combined with the parameters of the Rayleigh distribution to arrive at a relationship between the significant wave height and the highest expected waves (see Appendix). As an example, assume that the significant wave height in an area is 10 feet. One out of every 100 waves (or 1% of the waves) will have a height greater than about 16 feet. One out of every 1000 waves (or 0.1% of the waves) will have a height greater than about 19 feet. A common rule of thumb often utilized is that the highest expected wave is equal to twice the significant wave height. This kind of height would be observed in about 1 out of every 3000 waves. Incidentally, if an average wave period is known, the frequency of observing the highest expected wave can be obtained by multiplying 3000, or any other number of waves, by the wave period. If the average wave period is 10 seconds, then a wave two times as high as the significant wave height will be observed on average every 30,000 seconds, or about 8.3 hours. In reality, wave height is limited by wave steepness: deep water waves (those in an area where the ocean depth is greater than half the wavelength) begin to break when their height to length ratio exceeds 1/7 (see Appendix).

Here's an example to put all this into context. On September 15, 2004, Hurricane Ivan was racing northward across the Gulf of Mexico towards the Alabama and Florida coastline with strong 115 kts winds that were producing extremely large waves. The Tropical Analysis and Forecast Branch (TAFB) at the Tropical Prediction Center/National Hurricane Center predicted seas (significant wave heights) as high as 55 ft the morning before the hurricane moved into the northern Gulf of Mexico, and this forecast verified quite well with a significant wave height of 52.4 ft reported at NDBC buoy 42040 at 8:00 p.m. as the center of Ivan passed overhead. But not every wave that passed the buoy had a height of 52 feet, so what was the character of the actual wave field during the hurricane?

A significant wave height of 52 feet seems quite large, but realistically a sizeable portion of the actual waves during the hurricane did not attain that height. The most frequent wave height, according to the Rayleigh distribution, was about 26 feet—still an

Significant Wave Height (H_S)	Most Frequent Wave Height (H_f)	Average Wave Height ( )	Average of Highest 10% of Waves ( )
4	2	2.5	5
8	4	5	10
10	5	6	13
12	6	7.5	15
15	7.5	9	19
20	10	13	25
Wave conditions at NDBC Buoy 42040 during Hurricane Ivan			
52.4	26.1	32.8	66.7

Table 1. Relationship between selected National Weather Service forecast wave heights (significant wave height in feet) and other parameters such as most frequent wave height, average wave height, and average height of the highest 10% of waves (also in feet.) The most frequent wave height, average wave height, and average of the highest 10% of waves at Buoy 42040 during Hurricane Ivan are calculated from the theoretical Rayleigh distribution for the observed significant wave height of 52.4 feet.

imposing and dangerous wave for a mariner out at sea. A few waves did build higher than the significant wave height, with the average of the highest 10% of the waves being around 67 feet! ***Figure 2*** shows the theoretical distribution of the wave heights at Buoy 42040 as Hurricane Ivan was passing overhead, and the last row in ***Table 1*** gives the calculated values from the distribution.

There is a limit on the highest wave that would be expected. The average wave period reported by the buoy at the same time as the report of the maximum wave height was about 12 seconds. Therefore, a wave with a 12 second period (which incidentally would have a wavelength of 735 feet), would break when its wave height exceeded 105 feet. Individual waves with shorter periods would break at much shorter wave heights. Based on the rule of thumb for the highest expected wave, a significant wave height of 52 feet could yield a wave of about 104 feet, which lies within the possible range of wave heights given the breaking wave height.

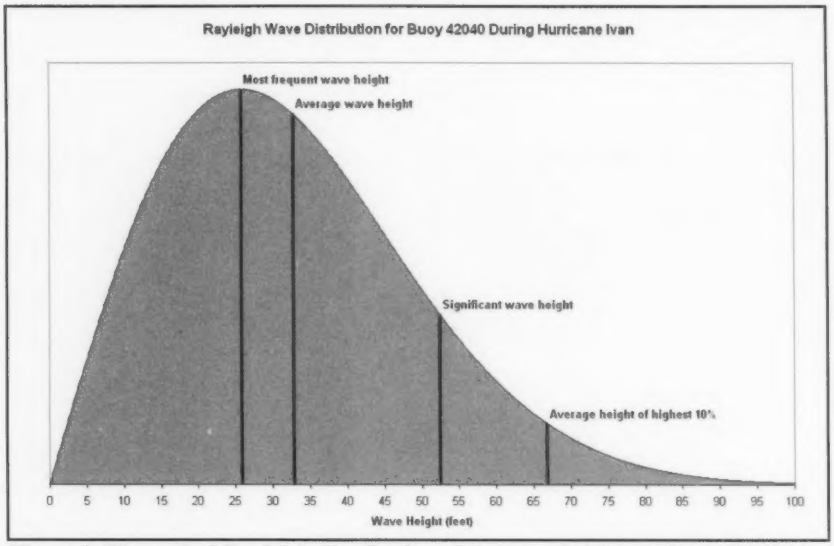

Figure 2. Theoretical Rayleigh distribution of the wave heights at Buoy 42040 at 8:00 pm September 15, 2004 as Hurricane Ivan was passing overhead.

Conclusion

The NWS marine forecasts provided by the Tropical Prediction Center, Ocean Prediction Center, and coastal Weather Forecast Offices convey important wave field information that goes beyond just the expected significant wave height. Other useful wave parameters, such as the most frequent wave and highest expected waves, can be derived that can go into making important decisions regarding safe marine operations. Estimations of the highest expected wave height are especially important in extreme weather events and can be beneficial when trying to avoid large and occasionally devastating storm-generated waves. So, don't be caught off guard by a 26 foot wave the next time the NWS marine forecast reads "SEAS 12 TO 15 FEET"!

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Biography

Robbie Berg has worked as a forecaster in the Tropical Analysis and Forecast Branch of the Tropical Prediction Center/National Hurricane Center since June 2002. He received two B.S. degrees in meteorology and marine sciences from North Carolina State University and is currently pursuing a M.S. degree in meteorology from the University of Miami. Previous work experience includes hurricane research at the NOAA Environmental Technology Laboratory in Boulder, Colorado.

Jamie Rhome has worked as a forecaster in the Tropical Analysis and Forecast Branch of the Tropical Prediction Center/National Hurricane Center since September 1999. He received his B.S. and M.S. degrees in meteorology from North Carolina State University. Previous work experience includes the United States Environmental Protection Agency and the State Climate Office of North Carolina. In addition to his professional experience in marine meteorology, Jamie is an avid offshore fisherman.

Acknowledgments

The authors wish to thank Eric Holweg, Dr. Rick Knabb, Alison Krautkramer, and Daniel Brown for their constructive comments and suggestions on this paper.

Appendix

Most frequent wave height H_f :

$$H_f = 0.498 H_S \approx \frac{1}{2} H_S$$

Average wave height :

$$\overline{H} = 0.625 H_S \approx \frac{5}{8} H_S$$

Ten percent of the highest waves will be higher than:

$$H_{1/10} = 1.074 H_S$$

Average of the highest 10% of the waves:

$$\overline{H_{1/10}} = 1.272 H_S$$

Height of the highest N% of the waves (where P=N/100):

$$h = .705 H_S \sqrt{-\ln P}$$

Breaking height of a wave hb is related to the wave period t by

$$h_b = 0.731 \tau^2$$

AMVER/SEAS 2000 Update, June 2005

Gary Soneira, AOML GOOS Center, Silver Spring, MD

The Shipboard Environmental [data] Acquisition System (SEAS) is a familiar tool for about 400 merchant and research vessel operators. The original system, designed in the early 80's to take surface and subsurface marine observations using a Tandy TRS-80, evolved through the Hewlett Packard-85 then IBM compatible personal computers running Microsoft DOS versions, now has evolved into a Windows environment. The new software has been named SEAS 2000.

Over the past two decades SEAS shipboard and shore-side software has proven itself to be a reliable mechanism for an end-to-end data system that allows for collection of marine meteorological and oceanographic data, the real-time transmission of that data, to the distribution on the Global Telecommunication System to national forecast and archiving centers around the world.

Development of SEAS 2000, which uses the Microsoft XP operating system, was intended to keep pace with improved computer systems found on modern merchant vessels. The software takes advantage of operating system enhancements such as multitasking, USB support, and superior graphics.

It's hard to imagine with a fleet of only about 400 ships, which is about 30% of the U.S. VOS fleet, SEAS participants provide 64% of the U.S. surface weather observations. The number of weather observations taken with SEAS in 2004 has increased 27% over the prior year. ***Figure 1*** shows the growth of SEAS over the past 5 years.

From the oceanographic side, fewer than 40 ships gather 57% of the global expendable bathythermograph (XBT) ocean profile data with SEAS. ***Figure 2*** shows the growth of SEAS XBT observations over the past 5 years.

Far more important than the quantity of data, SEAS 2000 has made a significant contribution toward improving the quality of marine observations. Basic quality and consistency checks are integrated into SEAS software. Since it's very difficult to quality control XBT observations at sea, all SEAS XBT data are automatically quality controlled on shore, before distribution.

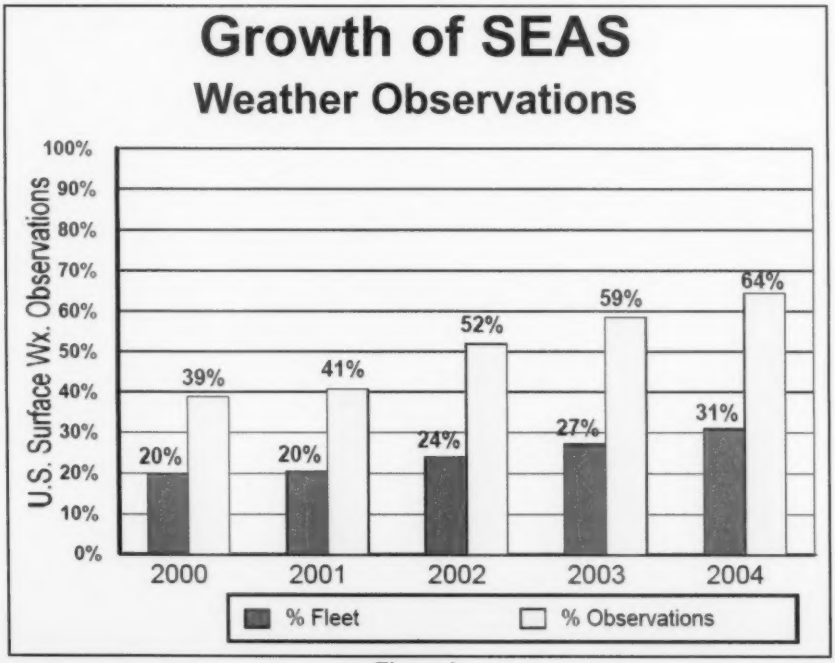


Figure 1.

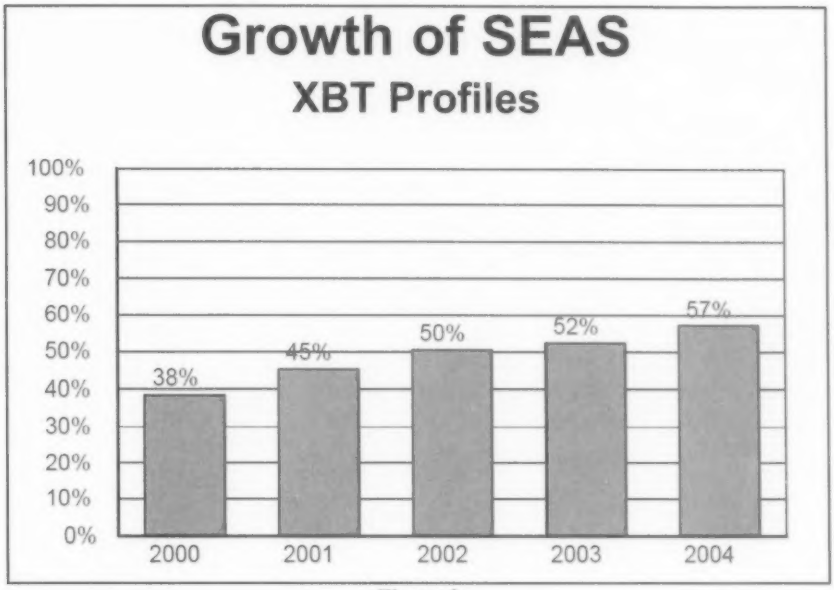


Figure 2.

Although SEAS 2000 already includes AMVER, marine mammal, iceberg, and drifting buoy deployment reports, additional enhancements are in various stages of development. These enhancements are directed toward greater data collection from a wider variety of environmental sensor suites. SEAS Program managers, scientists, and program managers around the world are looking to expand the role of commercial vessels as a critical component of the global ocean observing system. Those not already familiar with the SEAS Program, or wish to learn more about the application of XBT data, are encouraged to read the original article describing SEAS 2000 in the "Mariners Weather Log, Vol. 45, No. 2, August 2001, pages 50-58" and are invited to explore the NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML) web site at www.aoml.noaa.gov/phod.

All vessel operators participating in the program, from the ship owners to the bridge officers, should take great pride in their contributions toward improving marine forecasts and climate studies. Ultimately, these observations improve safety of life at sea and a greater understanding of climate variability. The collecting of this information is a relentless task, and we tip our hats in gratitude to those mariners that continue to provide such reliable data for the good of the world's populace, most of which know nothing of the importance of this work.

Shipwreck: Maunaloa II

by Skip Gilham, Vineland, Ontario, Canada

Maunaloa II had a long and diverse career on both sides of the Great Lakes. The ship was part of the largest American fleet of lakers ever assembled and later joined the second largest fleet on the Canadian side.

The ship was built in Chicago and launched on August 12, 1899. It was designed to be the steamer **Tennessee,** but it was sold prior to completion and joined the Minnesota Steamship Company as the ore carrier **Maunaloa**.

Measuring 452 feet long by 52 feet, 3 inches wide, the 4,951 gross ton freighter was equipped with a powerful 2,000 horsepower quadruple expansion engine. The coal burning steamer had four cargo holds that were serviced by 13 hatches.

Maunaloa went to work in the ore trade, but this was a time of change in the steel industry. In 1900, the vessel moved under the banner of Federal Steel, and the next year it was one of 112 vessels to form the initial Pittsburgh Steamship Division of the newly created United States Steel.

It was not unusual in those days to have powerful freighters tow cargo laden barges. Wood steamers often pulled old schooners while a new type of consort barge was constructed to work with the increasingly larger lakers. Such consorts were similar in size and capacity but only required about half the number of crew.

Maunaloa was often engaged to pull a barge and got into trouble doing this on October 13, 1902. With the ore laden BARGE 129 in tow, **Maunaloa** was crossing Lake Superior, buffeted by a fall gale, when the towline parted. The freighter turned to reconnect, but on the approach **Maunaloa's** port anchor ripped open the hull of the powerless vessel. BARGE 129 sank quickly, but all on board were saved.

The next year **Maunaloa** collided with the tug **Edward Gillen** off the Superior entry on May 18; the smaller vessel sank with the loss of one life.

Other than the two early incidents, **Maunaloa** had a long a productive career. It provided vital supplies of iron ore through two World Wars and survived the Depression era when many smaller ships were tied up for good.

The vessel was rebuilt in 1922, with the pilothouse being moved forward instead of a at a location between the first and second hatch. A "doghouse" for larger crew accommodation then occupied the spot where the pilothouse had been.

At the end of World War Two, this ship was sold to the Upper Lakes and St. Lawrence Transportation Company into Canadian registry as **Maunaloa II**. This company dated from 1931 and grew into the second largest Canadian fleet on the inland seas. It continues to provide service for customers as Upper Lakes Shipping.

Maunaloa II now concentrated in the transportation of grain, continued to pull consort barges for another fifteen years, and then carried on alone.

During part of this period, from 1949 to 1965, the vessel carried 395 cargoes or an average of just over 23 trips a years. Most cargoes (335) were various grains but the ship also hauled ore (47), coal (10), salt (2) and stone (1).

Prior to 1959 the ship was confined to the five Great Lakes, but, when the St. Lawrence Seaway opened in 1959, large vessels like **Maunaloa II** could now trade down the St. Lawrence. It made its first transit of the new waterway in August 1959, taking grain to Trois Rivieres and Quebec City and then loading iron ore at Contracoeur for Cleveland. The ship made a single trip to Baie Comeau in 1961, and three to Trois Rivieres in 1962 before leaving the Seaway and returning to the Great Lakes for good.

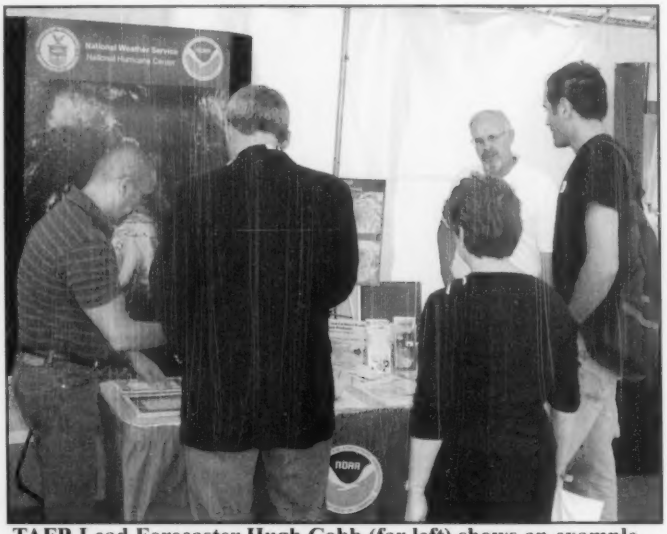
In the later years, **Maunaloa II** primarily hauled grain to the Lake Huron port of Goderich with occasional diversions to Collingwood, Midland or Milwaukee. The last cargo was delivered to Toronto on June 17, 1971, and the vessel departed the next day for the scrap yard at Hamilton, Ontario. Work on breaking up the veteran freighter was completed in May 1972.

The *Maunaloa II* in Port Colborne, June 16, 1971.

Tropical Prediction Center (TPC) Meteorologists Educate Mariners at the Miami International Boat Show.

Daniel P. Brown and Hugh D. Cobb III, Tropical Analysis and Forecast Branch ,
Tropical Prediction Center, NOAA/NWS Miami, Florida

Marine forecasters from the TPC's Tropical Analysis and Forecast Branch (TAFB) staffed the TPC/National Hurricane Center's (NHC) booth at the Miami International Boat Show in February. The show is one of the largest boat shows in the world, with an estimated 145,000 visitors to this year's show. The show attracts a wide range of mariners, ranging from casual weekend boaters to professional mariners that spend a large amount of time at sea. During the 5-day show, hundreds of boaters stopped by the booth to inquire about marine weather and to comment on the busy 2004 hurricane season. Forecasters provided marine weather-related educational literature and displayed examples of TAFB's graphical and textual marine products. The show not only provided an avenue for the forecasters to answer questions and educate inexperienced boaters, it also provided a great opportunity for TAFB marine forecasters to interact with many marine customers. Several customers stressed how much they rely on our forecast products in order to remain safe each day.



TAFB Lead Forecaster Hugh Cobb (far left) shows an example of a TAFB graphical marine forecast to an interested boater, while NWS Miami Warning Coordination Meteorologist (WCM) Jim Lushine (back right) fields questions at the 2005 Miami International Boat Show.

Changes to the Point Reyes, California and Honolulu, Hawaii Marine Radiofax Schedules.

Daniel P. Brown and Hugh D. Cobb III, Tropical Analysis and Forecast Branch ,
Tropical Prediction Center, NOAA/NWS Miami, Florida

On June 15, 2005, twelve new charts and the rebroadcast of eight charts will be added to the Point Reyes radiofax broadcast schedule (***Table 1***). The frequency of 12590.5 kHz will be changed to 12786.0 kHz. Changes were also planned for the Honolulu radiofax schedule (***Table 2***).

The changes involve replacing the two-panel Tropical 00/24 hour Wind/Wave Forecast (produced by TAFB) with a Tropical Sea State Analysis. The sea state analysis will be issued twice daily valid at 0000 and 1200 UTC. In addition, three wind/wave forecast charts are now being produced by TAFB that include separate 24-hour, 48-hour and 72-hour wind/wave forecasts. The 72-hour wind/wave forecast graphic will now be issued twice daily instead of once per day as was done previously. The Tropical Cyclone Danger Area Graphic (TCDG) will now be available via the Point Reyes radiofax broadcast four times daily. Previously this graphic was only available twice a day from Point Reyes. The transmission times of the TCDG remains unchanged on the Honolulu schedule since they have always been available four times daily. Users should look for future changes to the Honolulu fax schedule in order to carry an improved product suite. The radiofax schedules can be found on the National Weather Service's Marine web page at www.nws.noaa.gov/marine. A direct link can be found at www.nws.noaa.gov/om/marine/rfax.pdf.

Pt. Reyes, California U.S.A.

CALL SIGN	FREQUENCIES	TIMES	EMISSION	POWER
NMC	4346 kHz	NIGHT	F3C	4 KW
	8682 kHz	CONTINUOUS	F3C	4 KW
	12786 kHz	CONTINUOUS	F3C	4 KW
	17151.2 kHz	CONTINUOUS	F3C	4 KW
	22527 kHz	DAY	F3C	4 KW

TRANS TIME	CONTENTS OF TRANSMISSION	RPM/IOC	VALID TIME	MAP AREA
0140/1400	TEST PATTERN	120/576		
0143/1403	NE PACIFIC GOES IR SATELLITE IMAGE	120/57	600/12	6
0154/1414	PACIFIC GOES IR SATELLITE IMAGE	120/576	00/12	5
0205/1425	TROPICAL SEA STATE ANALYSIS	120/576	00/12	4
0215/1435	TROPICAL 24HR WIND/WAVE FORECAST	120/576	00/12	4
0225/----	TROPICAL 48HR WIND/WAVE FORECAST	120/576	0000	4
0235/----	TROPICAL 72HR WIND/WAVE FORECAST	120/576	0000	4
0245/1445	500MB ANALYSIS	120/576	00/12	1
0255/1455	SEA STATE ANALYSIS	120/576	00/12	1/8
0305/1505	SURFACE ANALYSIS (PART 1 NE PACIFIC)	120/576	00/12	2
0318/1518	SURFACE ANALYSIS (PART 2 NW PACIFIC)	120/576	00/12	3
0331/1531	REBROADCAST SURFACE ANALYSIS PART 1	120/576	00/12	2
0344/1544	REBROADCAST SURFACE ANALYSIS PART 2	120/576	00/12	3
0357/1557	TROPICAL CYCLONE DANGER AREA	120/576	03/15	10
0408/1608	TROPICAL SURFACE ANALYSIS	120/576	00/12	4
0655/1840	TEST PATTERN			
0657/----	2033Z REBROADCAST (96HR 500MB)	120/576	1200	1
0707/----	2043Z REBROADCAST (96HR SURFACE)	120/576	1200	1
0717/----	2053Z REBROADCAST (96HR WIND/WAVE)	120/576	1200	1
0727/----	2103Z REBROADCAST (96HR WAVE PERIOD)	120/576	1200	1
----/1842	SST ANALYSIS	120/576	LATEST	9
----/1852	SST ANALYSIS	120/576	LATEST	6
0737/1902	TROPICAL GOES IR SATELLITE IMAGE	120/576	06/18	7
0748/1913	SEA STATE ANALYSIS	120/576	06/18	8
0758/1923	24HR 500MB FORECAST	120/576	00/12	1
0808/1933	24HR SURFACE FORECAST	120/576	00/12	8
0818/1943	24HR WIND/WAVE FORECAST	120/576	00/12	8
0828/1953	48HR 500MB FORECAST	120/576	00/12	1
0838/2003	48HR SURFACE FORECAST	120/576	00/12	1
0848/2013	48HR WIND/WAVE FORECAST	120/576	00/12	1
0858/2023	48HR WAVE PERIOD/SWELL DIRECTION	120/576	00/12	1
----/2033	96HR 500MB FORECAST	120/576	1200	1
----/2043	96HR SURFACE FORECAST	120/576	1200	1
----/2053	96HR WIND/WAVE FORECAST	120/576	1200	1
----/2103	96HR WAVE PERIOD/SWELL DIRECTION	120/576	1200	1
0908/2113	PACIFIC GOES IR SATELLITE IMAGE	120/576	06/18	5
0919/2124	SURFACE ANALYSIS (PART 1 NE PACIFIC)	120/576	06/18	2
0932/2137	SURFACE ANALYSIS (PART 2 NW PACIFIC)	120/576	06/18	3
0945/2150	TROPICAL SURFACE ANALYSIS	120/576	06/18	4
0959/2204	TROPICAL 24HR WIND/WAVE FORECAST	120/576	06/18	4
1009/2214	TROPICAL CYCLONE DANGER AREA	120/576	09/21	10
1120/2320	TEST PATTERN	120/576		
1124/2324	BROADCAST SCHEDULE (PART 1)	120/576		
1135/2335	BROADCAST SCHEDULE (PART 2)	120/576		
1146/----	REQUEST FOR COMMENTS	120/576		
1157/----	PRODUCT NOTICE BULLETIN	120/576		
1208/----	TROPICAL 48HR WIND/WAVE FORECAST	120/576	1200	4
1218/----	TROPICAL 72HR WIND/WAVE FORECAST	120/576	1200	4
1228/2346	TROPICAL 48HR WAVE PERIOD/SWELL DIR	120/576	12/00	4
----/2356	TROPICAL 72HR WAVE PERIOD/SWELL DIR	120/576	0000	4

MAP AREAS:

1.	20N - 70N,	115W - 135E	2.	20N - 70N,	115W - 175W
3.	20N - 70N,	175W - 135E	4.	20S - 30N,	EAST OF 145W
5.	05N - 55N,	EAST OF 180W	6.	23N - 60N,	EAST OF 150W
7.	7.05N - 32N,	EAST OF 130W	8.	25N - 60N,	EAST OF 155W
9.	40N - 53N,	EAST OF 136W	10.	0N - 40N,	80W - 180W

Table 1. Point Reyes, California marine radiofax schedule effective June 15, 2005

Honolulu, Hawaii, U.S.A.

CALL SIGN	FREQUENCIES	TIMES	EMISSION	POWER
KVM70	9982.5 kHz	1030-1630	F3C	5 KW
	11090 kHz	EXCEPT 2230-0354	F3C	5 KW
	16135 kHz	EXCEPT 1030-1630	F3C	5 KW
	23331.5 kHz	2230-0354	F3C	5 KW

TRANS TIME	CONTENTS OF TRANSMISSION	RPM/IOC	VALID TIME	MAP AREA
0007/1147	PACIFIC STREAMLINE ANALYSIS	120/576	18/06	K
----/1210	48 HR SURFACE FORECAST	120/576	1200	G
0030/1230	EAST PACIFIC GOES IR SATELLITE IMAGE	120/576	LATEST	EP
0045/1245	WEST PACIFIC GOES IR SATELLITE IMAGE	120/576	LATEST	SP
0103/1304	NORTH PACIFIC SURFACE PRESSURE ANALYSIS	120/576	18/06	J
0128/1328	48HR SURFACE/1000-500MB THICKNESS F'CAST	120/576	18/06	C
0148/1350	TROPICAL SURFACE ANALYSIS	120/576	18/06	H
0209/----	24HR STREAMLINE/ISOTACH FORECAST	120/576	0000	D
0234/----	48HR STREAMLINE/ISOTACH FORECAST	120/576	0000	D
----/1412	24HR WIND/WAVE FORECAST	120/576	0000	E
----/1428	48HR WIND/WAVE FORECAST	120/576	0000	E
0258/1444	24 HR WIND/SEAS FORECAST	120/576	00/12	G
0309/1503	48HR,72HR WIND/WAVE FORECAST	120/576	00/12	G
0320/1522	72HR,48HR WAVE PERIOD/SWELL DIR	120/576	00/12	G
0331/1541	REBROADCAST OF 0103/1304	120/576	18/06	J
0354/----	72 HR SURFACE FORECAST	120/576	0000	G
----/1607	24 HR SURFACE FORECAST	120/576	1200	G
----/1618	48 HR SURFACE FORECAST	120/576	1200	G
0405/----	PACIFIC SEA STATE ANALYSIS	120/576	1800	D
0437/1630	TROPICAL CYCLONE DANGER AREA	120/576	03/15	M
0533/1733	TEST-ID-SYMBOLS-GENERAL NOTICE	120/576		
0545/1745	SIGNIFICANT CLOUD FEATURES	120/576	03/15	A
0605/1804	PACIFIC STREAMLINE ANALYSIS	120/576	00/12	K
0630/1827	EAST PACIFIC GOES IR SATELLITE IMAGE	120/576	LATEST	EP
0645/1842	WEST PACIFIC GOES IR SATELLITE IMAGE	120/576	LATEST	SP
0656/1853	NORTH PACIFIC SURFACE PRESSURE ANALYSIS	120/576	00/12	J
0721/1918	PACIFIC OCEAN SEA SURFACE TEMPS	120/576	LATEST	NPA
0741/1937	24 HR WIND/WAVE FORECAST	120/576	06/18	G
0800/1956	TROPICAL SURFACE ANALYSIS	120/576	00/12	H
0823/----	24 HR SEA STATE FORECAST	120/576	18/00	K
----/2018	SCHEDULE	120/576		
1030/2230	TROPICAL CYCLONE DANGER AREA	120/570	09/21	M
1045/-----	SCHEDULE	120/576		
----/2335	24HR SURFACE FORECAST	120/576	0000	G
----/2345	48HR SURFACE FORECAST	120/576	0000	G

MAP AREAS:						
	A	-	50N-30S, 110W-160E	J	-	50N-EQ , 110W-130E
	C	-	60N-55S, 055W-070E	K	-	30N-30S, 110W-130E
	D	-	50N-30S, 100W-120E	M	-	30N-20S 70W-140W
	E	-	60N-35S, 110W-130E	EP	-	55N-40S, 110W-155E
	F	-	50N-25S, 120W-120E	SP	-	05N-40S, 130W-165E
	G	-	30N-20S, 145W-080W	NPA	-	55N-EQ , 010W-160E
	H	-	40N-40S, 105W-120E			

Table 2. Honolulu, Hawaii marine radiofax schedule effective June 15, 2005.

From the Desk of a PMO: Supporting the Maine Maritime Academy or...How I Spent my 27th Wedding Anniversary (Sorry Linda...)

Tim Kenefick, Port Meteorological Officer, Charleston, SC

This was my fifth deployment in support of the VOS Program with the Maine Maritime Academy.

I reported aboard the "State Of Maine" in Castine on the 2nd and debarked in Aruba on the 16th of May. This was an extremely profitable two weeks, and, no, I didn't hit the lottery. I felt a real sense of duty and interest in contributing to the "Big Picture" that has been instilled by Captain Larry Wade and the officers and faculty.

I delivered lectures to each of the companies of the 2/C Midshipmen on NOAA, NWS, the VOS program, and taking and submitting weather observations. Plus I also went over Tropical Cyclones, severe weather evasion, and the mechanics of meteorology. Beyond that, I fielded questions about weather and oceanography from all the deck and many of the engineering students, plus the faculty and other officers on the ship. They learned that I was vaccinated with a phonograph needle and I'm a man of a few thousand words.

I was highly impressed with this latest class of Midshipmen from Maine. They were always ready to do the weather observation, (once they realized that the times listed in the Captain's Night Orders were in UTC), and they were always asking questions and answering them. They actively noted techniques for estimating the amounts and height of the clouds, the best place to observe seas and swells, how to best judge the visibility, then how to determine what's going to happen with the weather and why! They were all ready to listen and learn…

Delta Company really impressed me. They asked me to spend an afternoon with them because they were not on the schedule to have my lectures, due to my rotation out in Aruba. This I was happy to do, even though I lost my voice after 4 hours of motor mouthing. They gladly gave up their free time; it was only right to give back to the tax payer his dollars worth!

All of these young people are real "eager beavers," and genuinely interested in what was going on, keeping on top of everything! If they are half as enthusiastic out in the fleet, as they were out on this cruise, the VOS program will definitely prosper in the future. Maine Maritime Academy has a real reason to be extremely proud of this up-and-coming class of mariners.

In closing, I'd like to take this opportunity to thank Captain Larry Wade, Chief Mate Brendan McAvoy, 2/nd Mate Bill Erlanson, all the other officers and the faculty and the multitude of support personal—from Doc Iverson and Nurse Ellen, to all the engineering staff, John the IT guy, and Omar and his crew from Sodexho (who really put on quite a spread), the Admin and Supply and even Nancy the Ship's Barber (who has a well stocked library as I've seen in a Barber Shop in years), and the Bosun, Mark, who if it's on the ship, he knows where it is. They set aside time and place for me to "preach" the gospels of WMO, NOAA, NWS and the VOS Program, and I was listened to.

Sea Cadets listen while our Charleston PMO, Tim Kenefick relates sea stories.

Can it get any better than three hots and a cot at sea? Not when you're with Maine Maritime!

Your at-the-sea reporter, Tim Kenefick, Portly Meteorological Officer Charleston, SC

Marine Weather Review—North Atlantic Area January through April 2005

By George P. Bancroft, NOAA National Center for Environmental Prediction

Introduction

The stormiest period was January through the first half of February when an active storm track took deepening low-pressure systems on a northeastward track across the North Atlantic. One particularly intense low tracked across the British Isles and North Sea early in the month and another passed to the west of the British Isles toward the middle of the month. By February, the pattern became more variable under the influence of varying amounts of blocking high pressure in the eastern North Atlantic and at high latitudes. Some of the lows moved erratically and even formed cutoff lows, with one in particular off the southeast U.S. coast in mid-April producing storm-force winds and very high seas.

There was no tropical cyclone activity during this four-month period, although such cyclones can develop prior to the official start of the Atlantic hurricane season on June 1.

Significant Events of the Period

North Atlantic Storm, January 2–7: A developing area of low pressure moved northeast off the Labrador coast on January 1 and passed east of Greenland early on the 3rd, developing hurricane-force winds between the center and the Greenland coast. The system attained a lowest central pressure of 950 hPa near 62N 34W at 0000 UTC on the 4th. That area usually lacks ship data, with OPC often using QuikScat satellite-derived winds to determine warning category. The storm passed northwest of Iceland on January 4, but a new main center formed near the Greenland coast early on the 7th, then drifted east and weakened as depicted in ***Figure 1***. Winds were briefly hurricane force near Cape Farewell. Among limited ship data, the **Godafoss** (V2XM) reported west winds of 50 kt near 58N 29W at 1800 UTC on the 4th. There were some impressive seas that developed between Iceland and the British Isles.

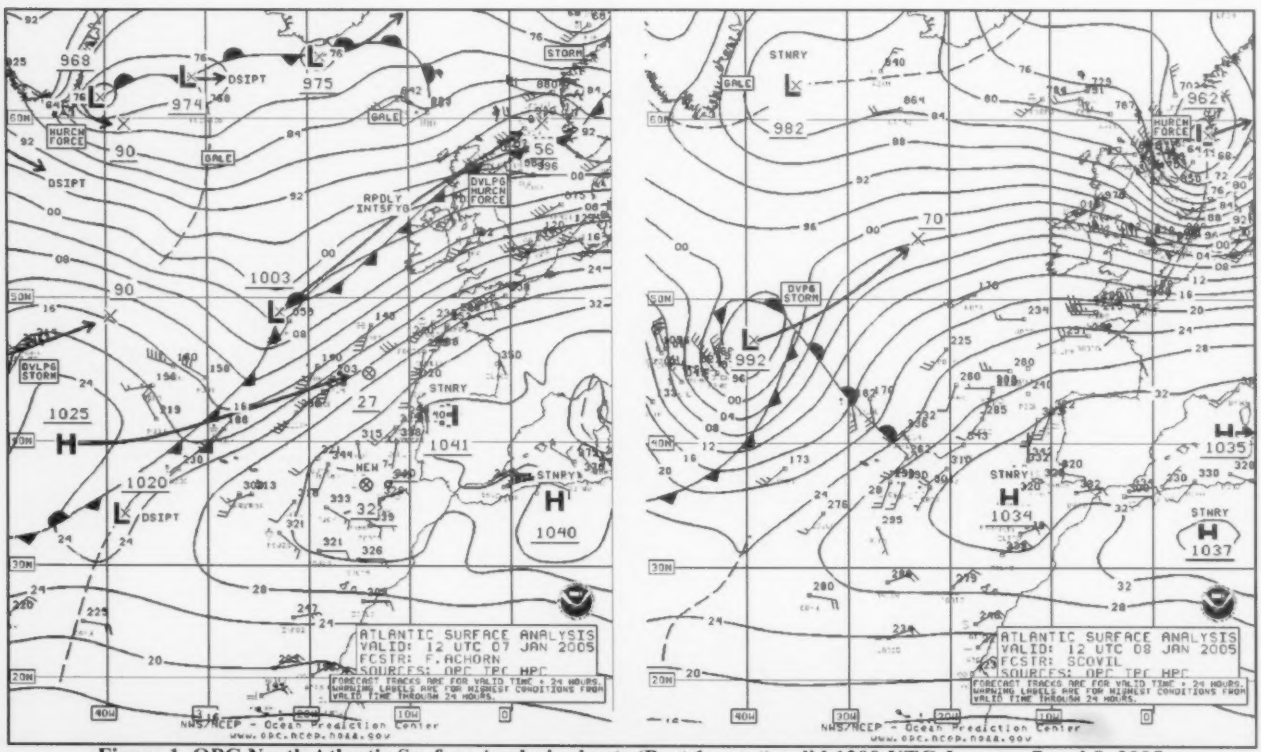


Figure 1. OPC North Atlantic Surface Analysis charts (Part 1 - east) valid 1200 UTC January 7 and 8, 2005.

The **Waverider** (TFSRT) reported 10.5 m (34 ft) near Iceland at 1300 UTC January 4. Among buoys, the highest seas reported were 9.5 m (31 ft) at 62108 (53.5N 19.5W) at 2200 UTC on the 4th, 10.0 m (33 ft) at 62105 (55N 12W) at 0400 UTC on the 5th, 12.0 m (40 ft) at 64045 (59N 11.5W) 0000 UTC on the 5th, and 10.5 m (35 ft) at 64046 (61N 5W) at 0400 UTC on the 5th.

North Sea Storm, January 7–8: ***Figure 1*** shows the explosive development of this hurricane-force storm from a flat frontal wave of low pressure over the twenty-four hour period ending at 1200 UTC January 8. This was the most significant event of the period for that area. The central pressure dropped 41 hPa in that period, with the second part of ***Figure 1*** showing the storm at maximum intensity. A 500 hPa analysis (**Figure 2**), valid in the middle of this period of rapid deepening, shows good support in the form of a strong short-wave trough developing negative tilt and a strong jet of at least 110 kts. See ***Reference 1*** for more information on the use of 500 hPa charts such as those broadcast by OPC through the USCG. The cyclone then passed quickly inland over Scandinavia later on the 8th. Maximum winds were observed around map time in the second part of ***Figure 1***. The **Noble Ton Van Langeveld** (A8BP2) (58N 8E) reported a northwest wind of 64 kts and 9.0 m seas (29 ft). **Sedco 711** (ELBU6) near 57N 1E encountered northwest winds of 89 kts and 10.0 m seas (32 ft). Three hours earlier, the data buoy 62414 (53.8N 2.9E) reported southwest winds of 66 kts, and buoy 62159 (56.5N 2.4E) reported 65-kts west winds three hours after map time. The buoy 62116 (57.7N 1.4E) reported a lowest pressure of 960.4 hPa at 1000 UTC on the 8th, and a 45-kts northwest wind one hour later. Seas reached 9.5 m (31 ft) at buoy 62120 (56.4N 2.1E) 1500 UTC January 8.

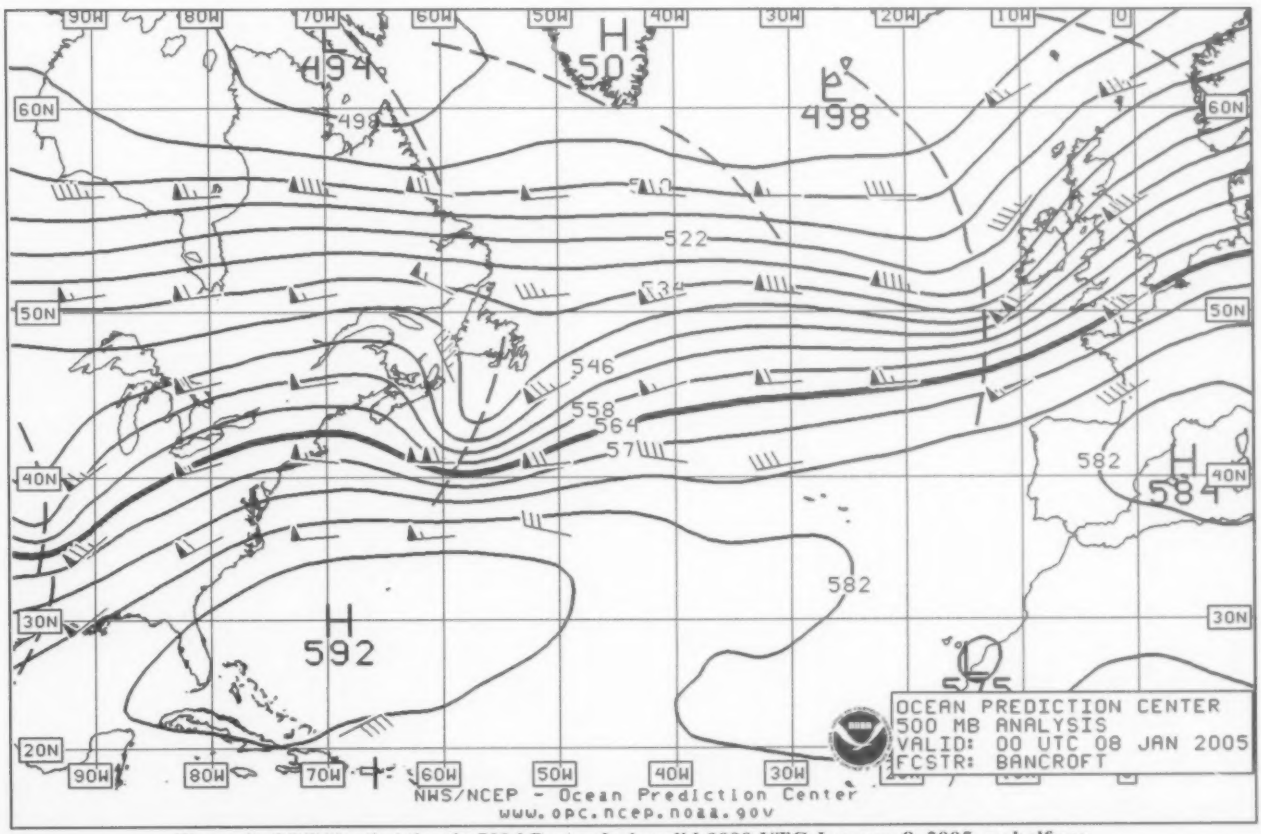


Figure 2. OPC North Atlantic 500 hPa Analysis valid 0000 UTC January 8, 2005, or halfway between the valid times of the two analysis charts in *Figure 1*. The chart is computer-generated with the short-wave troughs (appearing as heavy broken lines) manually added.

Eastern North Atlantic Storm of January 10–12: This storm was the second most intense of the period in the North Atlantic (in terms of central pressure) and likely packed the strongest winds. ***Figure 3*** displays the most rapid phase of development, in which the central pressure fell 45 hPa in the twenty-four hour period. The central pressure bottomed out at 946 hPa (27.94 in) six hours later. The infrared satellite image of ***Figure 4*** shows the storm at maximum intensity with a broad "comma head" of high-topped clouds and well-developed cloud spiral around a well-defined center. Deep cumulus-type clouds appear to south where cold air is entering the circulation. The **Noble Ton Van Langeveld** (A8BP2) (58N 1E) encountered southwest winds of 65 kts and 10.5 m seas (34 ft) at 0000 UTC on January 12, while the **Loch Rannoch** (MYJG2) reported south winds of 60 kts near 61N 2W. The buoy 62105 (54.9N 12.4W) reported a southwest wind of 66 kts and 13.0 m seas (42 ft) at 1300 UTC on the 11th, with seas reaching 16.0 m (52 ft) five hours later. Buoy 63118 (60N 4W) reported northwest winds of 70 kts at 1200 UTC on the 12th. QuikScat imagery revealed stronger winds, up to 85 kts as shown in **Figure 5**. A higher-resolution version of this imagery showed even a 90 kts wind barb about seven hours after the map time of the second part of **Figure 3**. The storm subsequently continued on a northeastward track, moving inland over Norway late on the 12th.

North Atlantic Storm of January 11–14: The next storm system emerged off the coast of Newfoundland early on the 11th and took a track northwest of its predecessor and was not as intense, attaining a lowest central pressure of 964 hPa at 0000 UTC January 13. OPC classified this as a hurricane-force storm from 0600 UTC on the 12th until 1200 UTC on the 13th, mainly based on QuikScat winds in an area lacking ship reports. A high-resolution QuikScat image valid at 2200 UTC on the 12th revealed up to 65 kts on the west and southwest sides. The system subsequently weakened to a gale while passing across Iceland early on January 15.

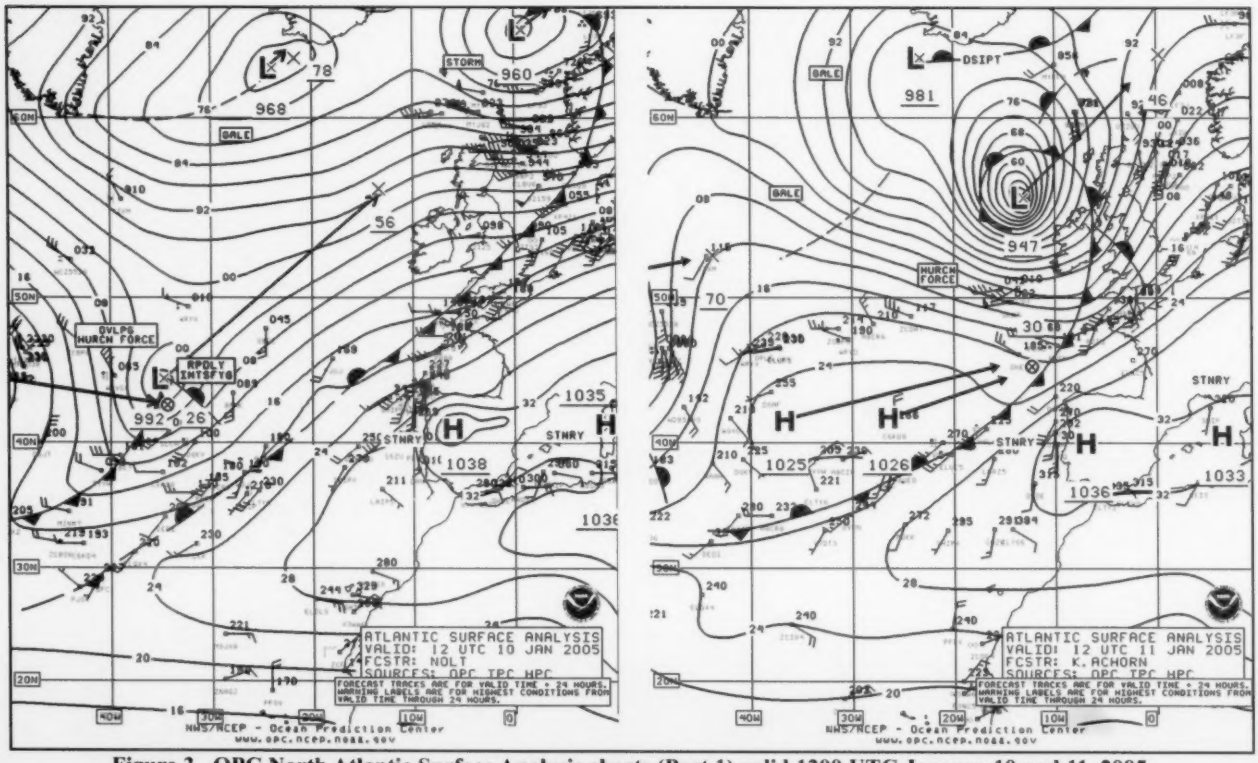


Figure 3. OPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC January 10 and 11, 2005.

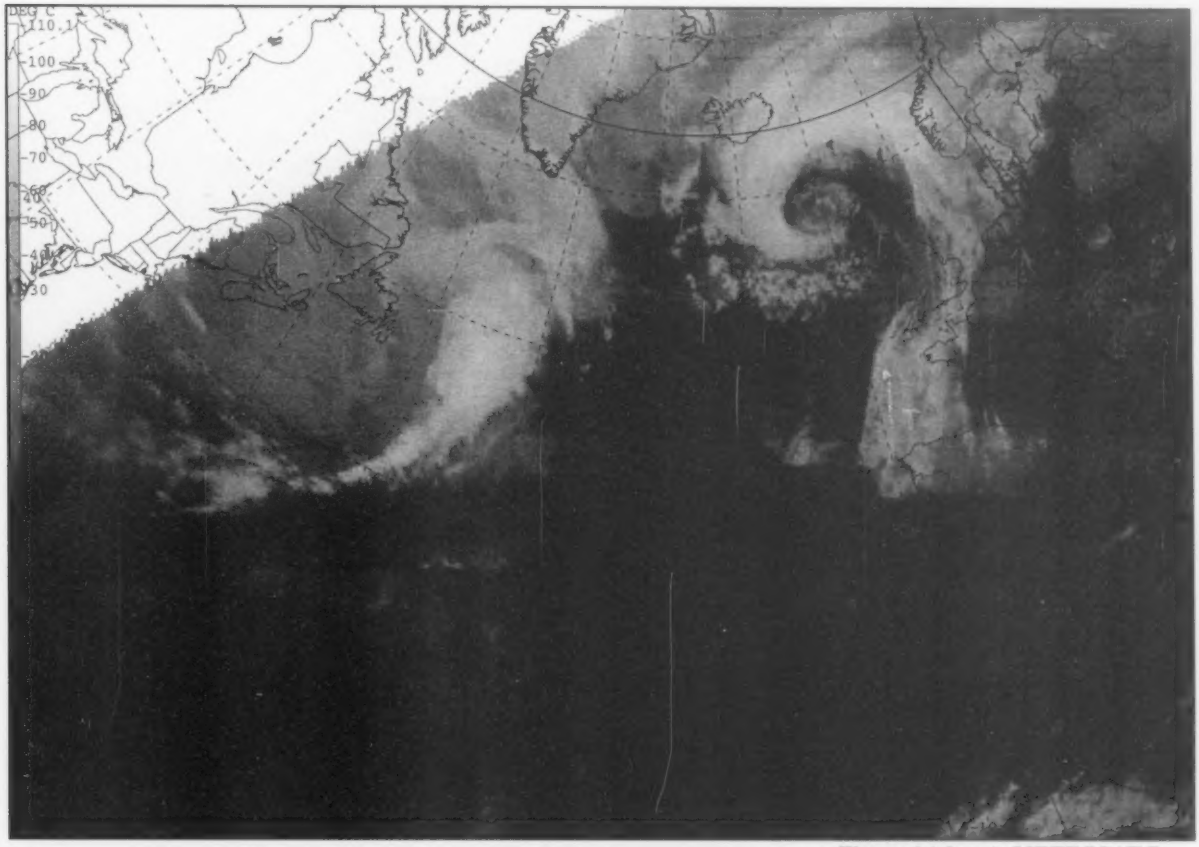


Figure 4 (above). METEOSAT-7 infrared satellite image valid 1800 UTC January 11, 2005. Satellite senses temperature on a scale from black (warm) to white (cold) in this type of imagery. The storm in *Figure 3* is shown near maximum intensity, with the time of the image six hours later than that of the second part of *Figure 3*.

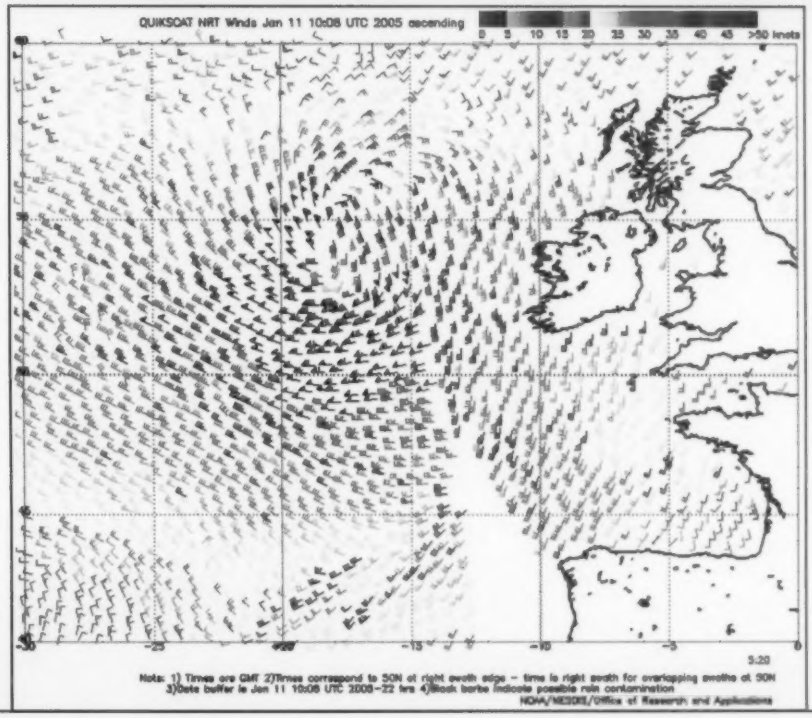


Figure 5 (left). QuikScat scatterometer image of satellite-sensed winds valid about 0520 UTC January 11, 2005. The valid time of the pass is about seven hours prior to the valid time of the second analysis in *Figure 3*.

Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

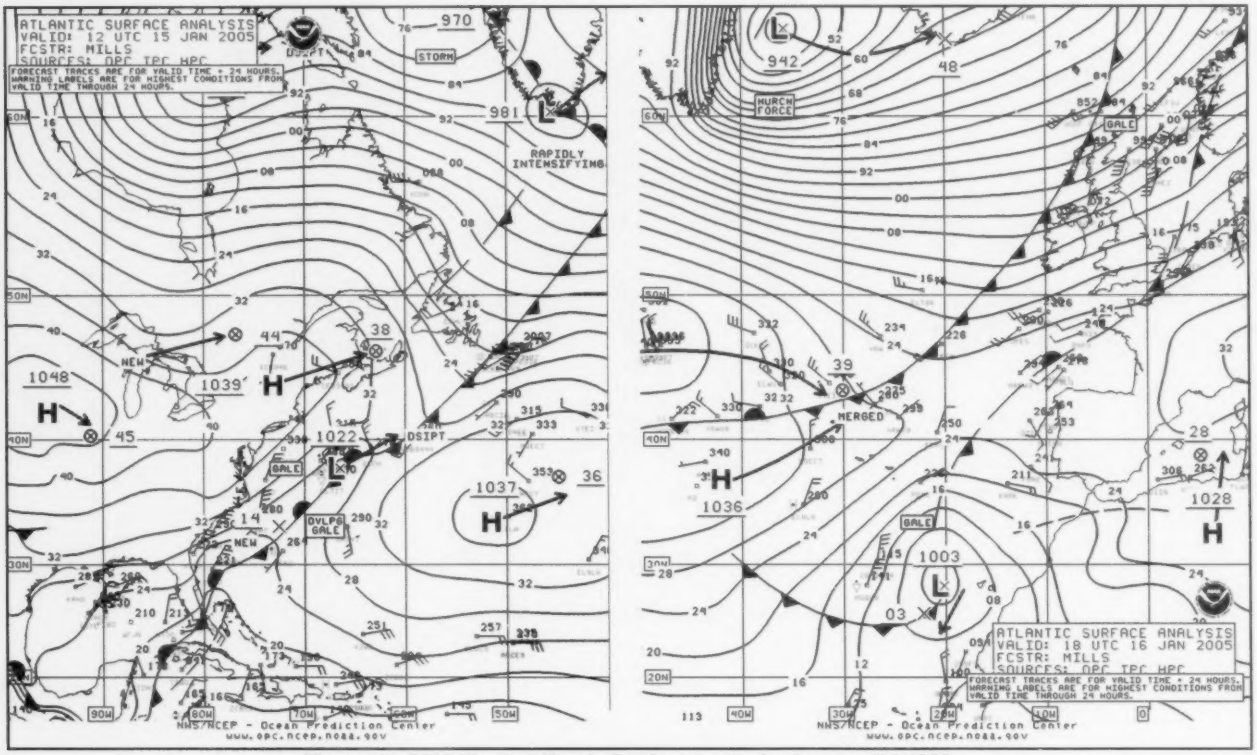


Figure 6. OPC North Atlantic Surface Analysis charts valid 1200 UTC January 15 (Part 2) and 1800 UTC January 16, 2005 (Part 1).

North Atlantic Storm of January 15–18: This storm evolved in a manner similar to that of the January 2–7 event. The developing cyclone moved northeast to near Cape Farewell early on the 15th and then rapidly intensified east of Greenland, developing a lowest central pressure of 942 hPa at 1800 UTC on the 16th, down 36 hPa over the preceding twenty-four hours (***Figure 6***). This was the most intense storm of the period, in both the North Atlantic and North Pacific. There were no ships reporting around the hurricane-force center, but the QuikScat image in ***Figure 7*** reveals a large swath of storm-force winds east of 44W and up to 70 kts near the northern edge of the figure. Selected ship and buoy reports farther away from the center are listed in ***Table 1***. The 16.5 m report from buoy 62108 was the second highest of the period in the North Atlantic. The storm moved northeast. The system then moved past Iceland late on the 17th and weakened, but like in the January 2–7 event, developed a new hurricane-force center near Greenland. This secondary low quickly became replaced by another low which had emerged off the southeast U.S. coast early on the 16th and was briefly at hurricane-force strength in the eastern Labrador Sea early on the 18th.

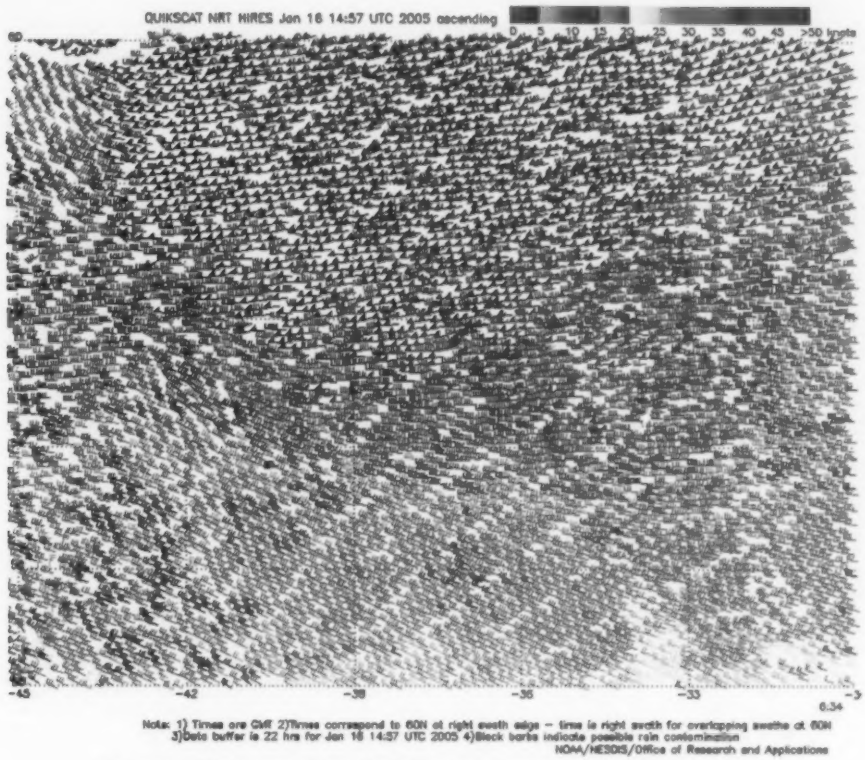


Figure 7. High-resolution QuikScat scatterometer image of satellite-sensed winds valid at about 0634 UTC January 16, 2005. The resolution of the image is 12.5 km, versus 25 km for the coarser-resolution version of the imagery. The valid time of the pass is about eleven and one-half hours prior to the valid time of the second part of Figure 6.

Image is courtesy of NOAA/NESDIS/Office of Research and Applications.

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND(kts)	SEAS(m/ft)
Waverider (TFSRT)	63N 20W	17/0000		9.0/30
Statengracht (PHAQ)	48N 20W	18/0000	W 50	9.5/31
Parkgracht (PGRE)	45N 8W	18/1200	NW 35	9.5/31
62566	58.3N 19.3W	16/1900	W 50	
62108	53.4N 19.3W	17/0600	W 35	10.5/35
62108	53.4N 19.3W	17/1900	W 40	16.0/52
62108	53.4N 19.3W	18/0400	NW 35	16.5/54
62105	54.9N 12.3W	17/1800	W 30	13.0/43
62029	48.6N 12.6W	18/0500	NW 35	13.0/42

Table 1. Some ship and buoy observations taken during the storm of January 15-18, 2005.

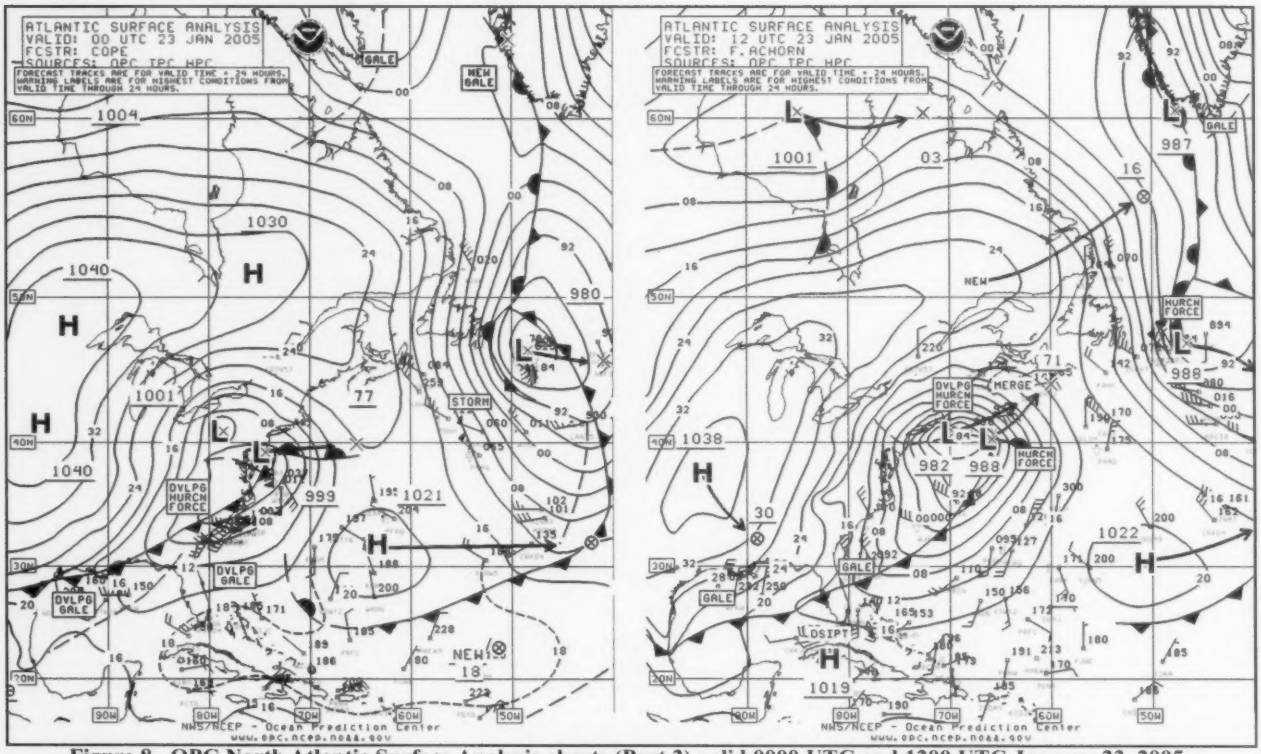


Figure 8. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC and 1200 UTC January 23, 2005.

Cutoff Storm, January 21–24: Development of blocking high pressure in the northeast Atlantic late in January led to lows moving north toward Greenland or cutting off to the south underneath the block. This storm did the latter, slowing down while passing southeast of Newfoundland late on the 22nd (***Figure 8***). The cyclone had moved off the mid-Atlantic U.S. coast early on the 21st. The storm briefly developed hurricane-force winds (See observations in ***Table 2***) before turning southeast and weakening.

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND(kts)	SEAS(m/ft)
Encounter (DPGZ)	38.5N 64W	24/0000	W 55	11.5/37
Godafoss (V2XM)	42N 67W	24/0000	N 60	
Finnpine (SFIR)	42.5N 66W	24/0000	N 60	10.5/34
Statengracht (PHAQ)	38N 57W	24/0600	SE 70	12.0/40
Charles Island	41N 64W	24/1200	NW 55	
Titus (SGAK)	47N 47W	23/1800	NW 55	9.5/31
Atlantic Companion (SKPE)	45N 47W	23/1800	NW 45	12.0/39
Platform (VEP717)	46.7N 48.7W	23/0900	NW 65	
Henry Goodrich (HP6038)	46.4N 48.4W	23/1200	NW 65	
GSF Grand Banks (YJUF7)	46.7N 48.7W	23/1200	NW 55	
44141	43.0N 58.0W	23/2200	SE 39 Gust 47	5.0/16
		24/0500		7.5/25

Table 2. Ship, buoy and platform observations taken during the coastal storm of January 22-26, 2005 and the storm southeast of Newfoundland occurring at the same time. VEP717, HP6038 and YJUF7 are oil platforms.

Coastal Storm of January 22–26: This storm was one of the most significant systems in the southwest North Atlantic during this period. ***Figure 8*** covers the rapid development as a secondary coastal storm while the primary low weakened near the eastern Great Lakes. The central pressure fell 27 hPa in the twenty-four hour period ending at 1800 UTC January 23, impressive for that latitude. Although the storm later intensified to as deep as 966 hPa while passing north through the Davis Strait late on the 25th, the strongest winds were observed off the U.S. East Coast. ***Table 2*** lists some ship and buoy observations taken early in this storm. The 70 kts ship report in ***Table 2*** was supported by high-resolution QuikScat data for 2225 UTC on the 23rd, which revealed winds to 75 kts in that area.

North Atlantic Storms, February 6–9: A frontal wave of low pressure over the Grand Banks at 1800 UTC February 5 deepened by 46 hPa in the following twenty-four hours as it moved to the east side of Greenland, developing a central pressure of 966 hPa. The system deepened further to 952 hPa near 65N 31W at 0600 UTC on the 7th. At that time the **Godafoss** (V2XM) encountered west winds of 65 kt near 58N 34W, while the **Irena Arctica** (OXTS2) and **Geysir** (WCZ5528) reported west winds of 60 kts at 59N 44W and 57N 36W, respectively. The storm passed northwest of Iceland shortly thereafter and was quickly replaced by another storm (966 hPa) by 1200 UTC on the 8th, which had moved off the Labrador coast early on the 7th. The system then drifted toward Iceland and maintained hurricane-force winds near the Greenland coast for the following twenty-four hours and later became absorbed by another low passing to the south on the 11th.

North Atlantic Storm, February 12–16: This cyclone developed south of the Canadian Maritimes on the 12th and passed just east of Newfoundland near 50N 51W with a 980 hPa central pressure at 1800 UTC on the 13th, where Platform VEP717 (46.7N 48.7W) briefly encountered southwest winds of 75 kts. The storm is shown in ***Figure 9*** passing west of Greenland but re-forming east of Greenland (second part of ***Figure 9***), where hurricane-force winds lasted for the twelve-hour period ending at 0600 UTC on the 16th as the low passed to the northeast. The ship **Bruarfoss** (V2PS8) at 64N 23W reported west winds of 60 kts at 0600 UTC February 16.

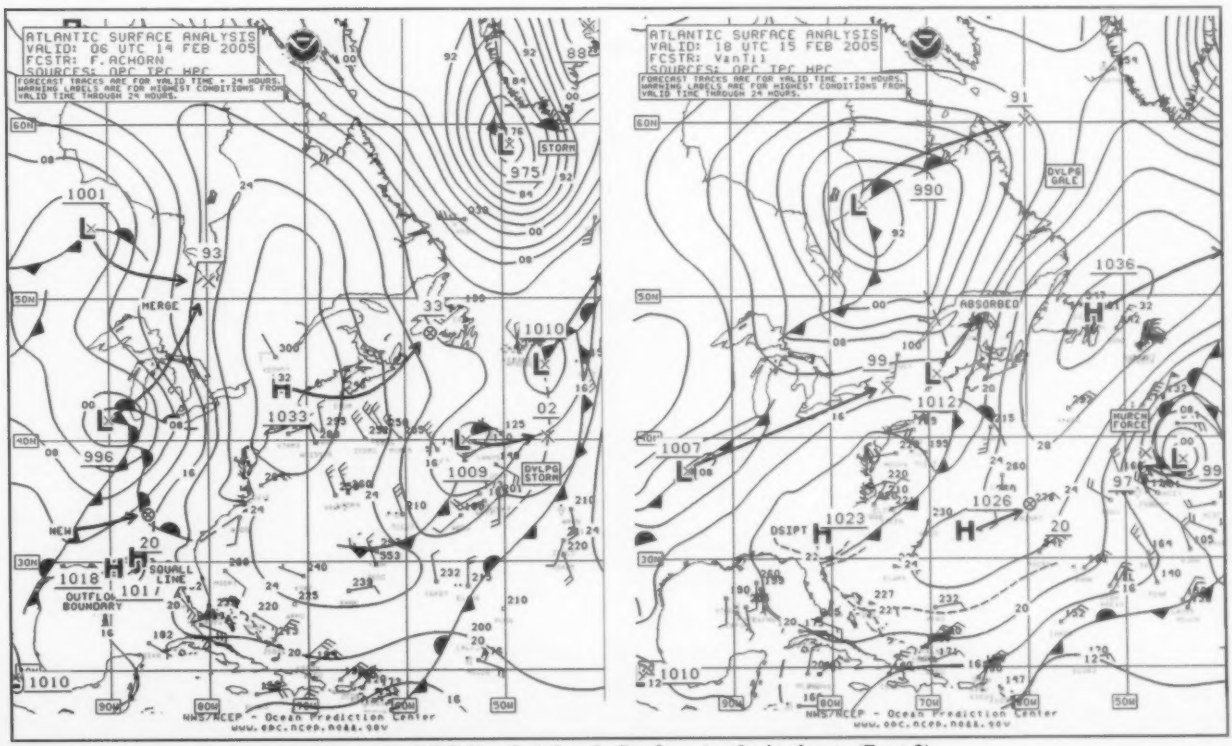


Figure 9. OPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC February 14 and 1800 UTC February 15, 2005.

South-Central Storm, February 14–16: ***Figure 9*** also shows the development of this relatively small but potent storm over the southern OPC high seas area. This storm was unusual in that it developed hurricane-force winds with a pressure of only 1002 hPa. ***Figure 10*** contains high-resolution QuikScat data obtained for this storm using a different retrieval method (***Reference 2***) and shows a large area of 65 to as high as 80-kts winds west and northwest of the center. A drifting buoy (41540 at 40.9N 45.2W) reported north winds of 58 kts at 1000 UTC on the 15th and north winds of 54 kts and 12.5 m seas (41 ft) eight hours later. At 1200 UTC February 15, the ship **Ada Gorthon** (SLCI) (42.5N 45.8W) reported northeast winds of 60 kts. At 1800 UTC on the 15th the same ship reported north winds of 52 kts near 43N 46W, while to the south **Mosel N** (A8CI7) encountered west winds of 49 kts. The storm was cut off on February 15 and drifted west, weakening to a gale on the 16th. The system then moved north on the 17th and was absorbed by another low coming off Newfoundland.

South-Central Storms, February 22–25: Two hurricane-force lows developed in close succession while tracking east, south of the Canadian Maritimes. They were relatively compact and moved through areas of relatively abundant ship and buoy data. In ***Figure 11*** the first low, the hurricane-force low near 39N 49W, originated near 40N 70W at 0000 UTC on the 22nd and is shown as the eastern low in the second part of ***Figure 11***, with the second storm close behind. Selected ship and buoy observations are listed in ***Table 3***, including several reports of over 9.0 m seas (30 ft). The two lows then turned northeast and merged into one storm near 44N 42W by the 25th, before turning southeast past the Azores on the 26th and weakening, blocked by high pressure to the north.

Coastal Storm, March 8-9: This storm was short-lived but intense, originating as a frontal wave of low pressure approaching the mid-Atlantic coast of the U.S. at 0600 UTC March 8. The low explosively deepened after passing offshore, with the central pressure falling 29 hPa in the twenty-four hour period ending at 0600 UTC on the 9th. The central pressure reached 962 hPa in the Gulf of Maine, before the storm moved inland and weakened over Quebec on the 9th. At 1800 UTC March 8 the ship **Maurice Ewing** (WLDZ) (37N 71W) reported south winds of 60 kts. Later, **Maurice Ewing** (WLDZ) (38N 71W) and **Manon** (SIWN) (38N 70W) reported west winds of 60 kt at 0000 UTC and 0600 UTC March 9, respectively. The buoy 41001 (34.7N 72.7W) reported south winds of 41 kts with gusts to 56 kts and 7.0 m seas (23 ft) at 1700 UTC on the 8th, with maximum significant wave heights of 10.0 m (33 ft) at 2300 UTC on the 8th. To the north, buoy 44004 (38.5N 70.5W) had

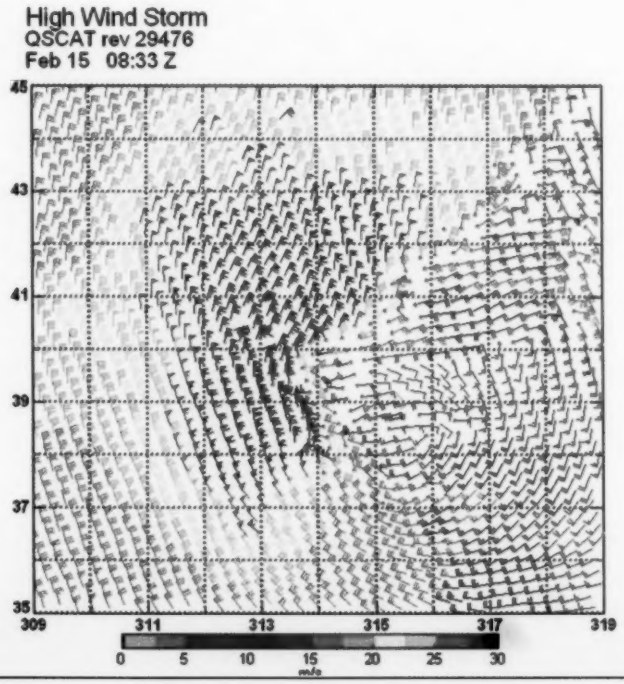


Figure 10. QuikScat wind display for the storm in *Figure 9* valid 0833 UTC February 15, 2005. The valid time is about nine and one-half hours prior to the valid time of the second part of *Figure 9*. Source: See *Reference 2*.

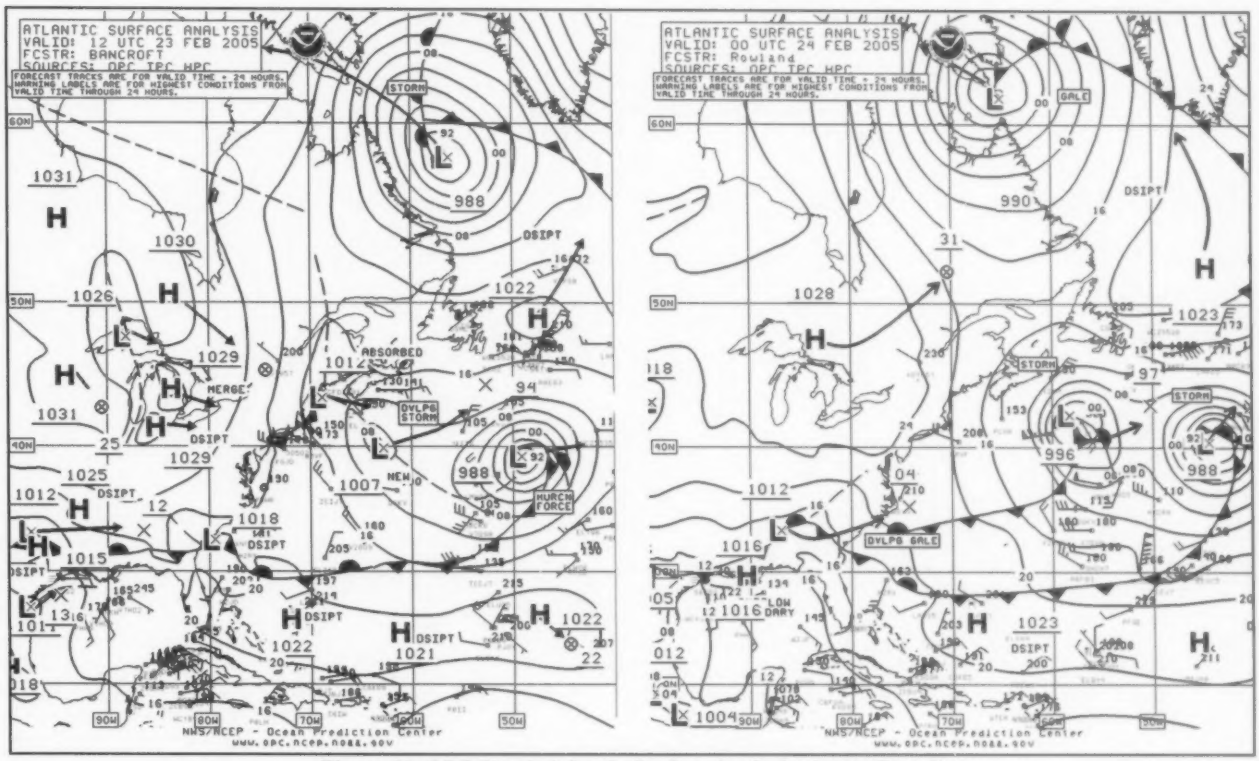


Figure 11. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC February 23 and 0000 UTC February 24, 2005.

northwest winds of 43 kts with gusts to 54 kts at 0100 UTC on the 9th, and a peak gust of 62 kts from the south at 2100 UTC March 8. Maximum seas were 9.5 m (31 ft) at 0400 UTC on the 9th. Gulf of Maine buoy 44005 (43.2N 69.2W) reported northwest winds of 41 kts with gusts to 51 kts and 5.5 m seas (18 ft) at 0700 UTC on the 9th. The C/MAN station Duck Pier (DUCN7 at 36.2N 75.7W) reported northwest winds of 38 kts with gusts to 45 kts, and a peak gust 65 kt, at 1800 UTC on the 8th.

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND(kt)	SEAS(m/ft)
Lykes Explorer (WGLA)	41N 60W	24/0000	W 65	
Galveston Bay (WPKD)	37N 55W	24/0000	W 50	
Galveston Bay (WPKD)	37N 57W	24/0600	NW 45	9.5/31
Sea-Land Independence (WGJC)	43N 43W	24/0600	E 50	11.5/38
Galveston Bay (WPKD)	37N 59W	24/1200	NW 45	11.0/36
Fairlift (PJHF)	40N 53W	24/1800	NW 55	
Fidelio (WQVY)	35N 44W	25/0600	NW 55	12.0/40
Fidelio (WQVY)	35N 45W	25/1200	NW 50	13.0/43
Buoy 41540	42N 44W	24/0000	E 70	

Table 3. Some ship and buoy observations taken during the storms of February 22-25, 2005.

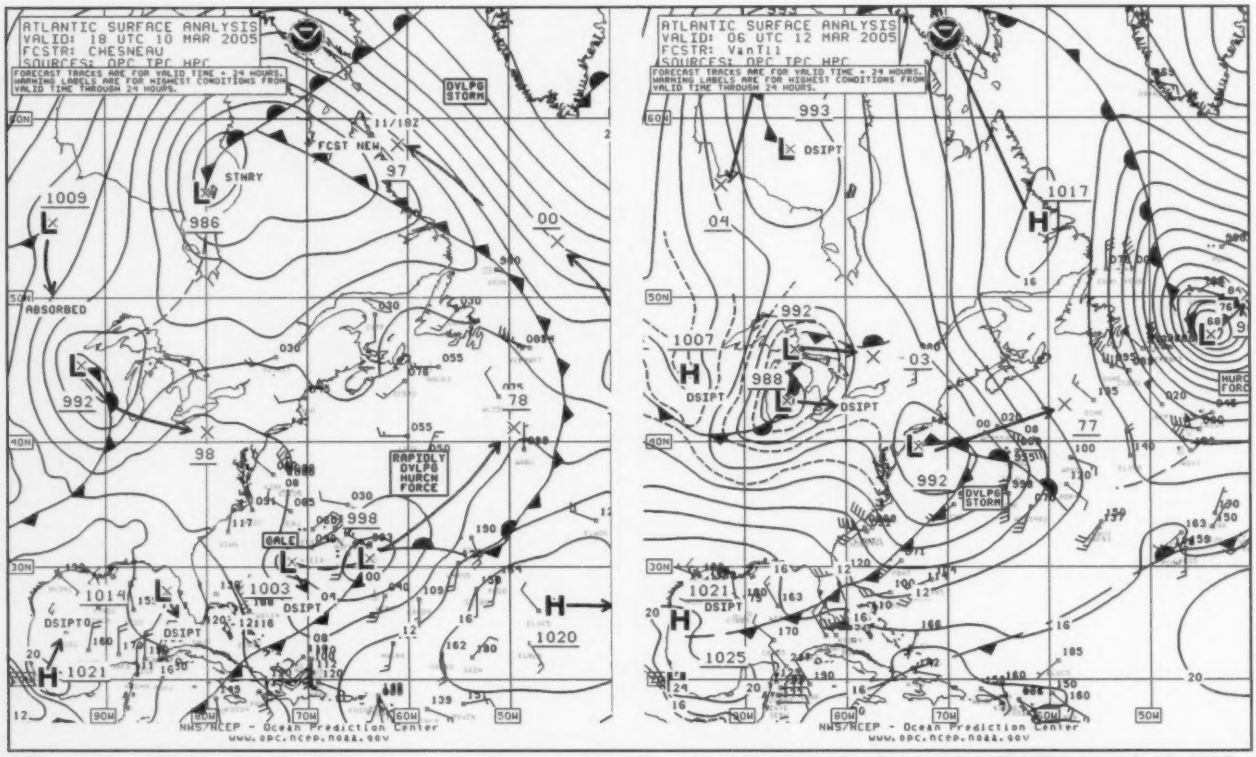


Figure 12. OPC North Atlantic Surface Analysis charts (Part 2) valid 1800 UTC March 10 and 0600 UTC March 12, 2005.

North Atlantic Storm, March 11–23: This long-lasting event began as depicted in ***Figure 12,*** as a low moving out of the subtropics that rapidly intensified to hurricane force by 1800 UTC March 11. The hurricane-force storm is shown east of Newfoundland twelve hours later, and the central pressure was 965 hPa. At that time Platform VEP717 (46.7N 48.7W) encountered northwest winds of 65 kts, while the vessel **Star Indiana** (S6BE) (42N 44W) reported southwest winds of 60 kts. The storm then stalled over the central North Atlantic early on the 13th, as the developing storm seen in ***Figure 12*** south of New England merged with the older system on the 13th. The combined system attained a central pressure as low as 955 hPa late on the 14th, with the circulation covering much of the North Atlantic. The system broke up into multiple centers rotating around a mean central center, occasionally producing brief hurricane force winds near the Greenland coast until the 19th. The complex system slowly wound down until the 24th when a new storm to the south took over. What is left at 0000 on the 24th appears in ***Figure 13*** north of the hurricane force low.

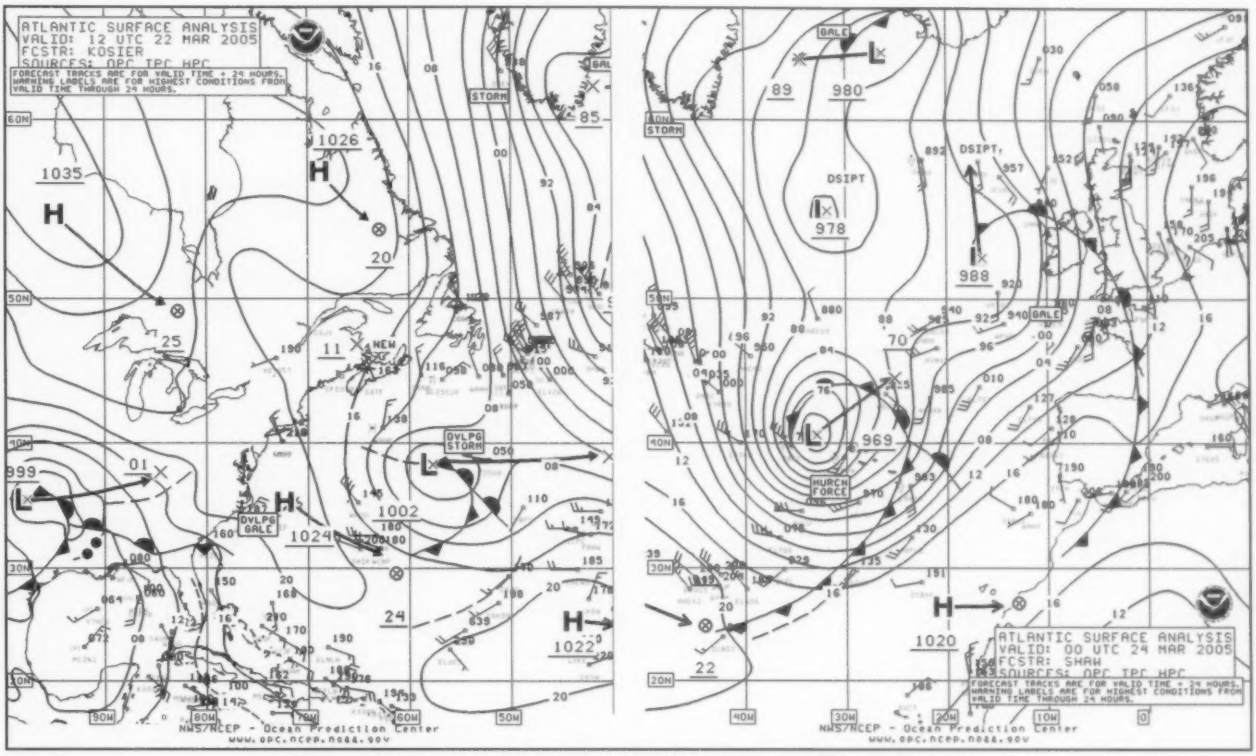


Figure 13 (above). OPC North Atlantic Surface Analysis charts valid 1200 UTC March 22 (Part 2) and 0000 UTC March 24, 2005 (Part 1).

South-Central Storm, March 22–25: The development of this storm is shown in ***Figure 13***, with the center deepening by 26 hPa in the first twenty-four hours. The second part of ***Figure 13*** shows the system near maximum intensity when the ship **Desh Shakti** (AUCU) near 35N 34W reported west winds of 70 kts. The author is unsure of the reliability of this report, as high-resolution QuikScat imagery received 16 hours prior showed 50 to 70 kts winds mainly north of 35N. Aside from this report, the strongest wind reported from a ship was a west wind of 55 kts from **Santa Lucia** (PBFC) (39N 38W) at 1800 UTC March 23. Reported seas were 10.0 m (33 ft). The storm then weakened to a gale on the 25th while drifting northeast, before stalling near France.

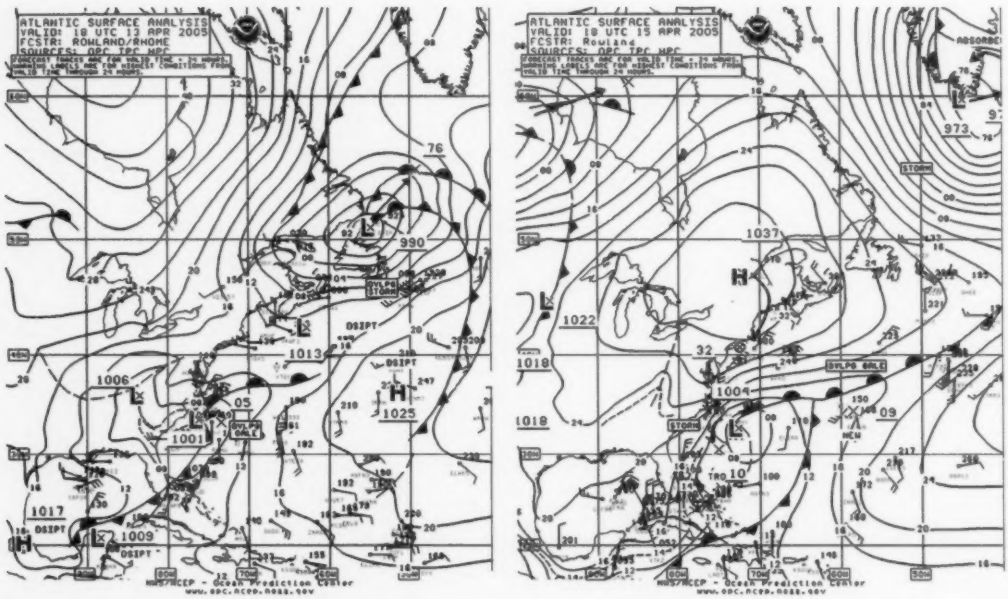


Figure 14. OPC North Atlantic Surface Analysis charts (Part 2) valid 1800 UTC April 13 and 15, 2005.

Coastal and Offshore Storm of April 14–16: This event began as a coastal redevelopment of an inland low, as shown in the first part of ***Figure 14***. The center moved offshore and became a storm near 33N 74W at 0000 UTC April 15, stalled, and then looped to the south on the 16th, blocked by strong high pressure to the north. Although the lowest pressure was only 1000 hPa, the storm was remarkable for the seas generated with north to northeast winds to 55 kts opposing the Gulf Stream, including the highest seas reported during the four-month period in the North Atlantic. There were several reports of seas over 40 ft (12 m) and are listed in ***Table 4*** below. The storm then weakened to a gale near 31N 70W at 0000 UTC on the 17th and reformed as a new center near 36N 61W, which moved off to the northeast before stalling in the central North Atlantic.

References

1. Sienkiewicz, J. and Chesneau, L., *Mariner's Guide to the 500-Millibar Chart* (Mariners Weather Log, Winter 1995).

2. Smith, Deborah K. and Wentz, Frank, Remote Sensing Systems, Santa Rosa, CA (E-mail communication through Sienkiewicz, Joseph (OPC), February 18, 2005).

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND(kt)	SEAS(m/ft)
Galveston Bay (WPKD)	39N 68W	15/1800	NE 51	11.5/37
Zim Iberia (4XFP)	34N 77W	15/1800	NE 55	11.5/37
Lykes Explorer (WGLA)	36N 75W	15/1800	N 45	6.5/21
Buoy 41001	35N 71W	16/0000	NE 35	7.5/25
SHIP	32.7N 76.5W	16/1200	N 50	11.5/38
SHIP	33N 77W	16/1200	N 35	6.0/19
SHIP	33.5N 76.4W	16/1800	N 50	13.5/44
SHIP	33.2N 75.8W	16/1800	N 50	17.0/56
Hoechst Express (DHER)	34.3N 75.9W	16/1800	N 55	8.0/26
Green Dale (WCZ5238)	33.5N 77.5W	16/1800	NE 35	4.5/15
SeaLand Producer (WJBJ)	36N 71W	17/0000	NE 40	13.0/42
SHIP	34N 75W	17/0600	NE 35	9.0/29

Table 4. Some ship and buoy observations taken during the coastal and offshore storm of April 14-16, 2005.

Marine Weather Review—North Pacific Area January through April 2005

By George P. Bancroft, NOAA National Center for Environmental Prediction

Introduction

This period includes the stormy winter and early spring months in which hurricane-force storms were common. Due to the sheer number of storms, the focus in this article is mainly on hurricane-force storms, labeled as such by OPC surface analysts on the basis of QuikScat and other satellite imagery, surface observations, model guidance and trends. February in particular was quite active. The activity decreased in April, which had one hurricane-force storm and another coming close.

The storm track was mainly from near Japan northeastward toward the Bering Sea and, depending on varying amounts of blocking high pressure over the northeast Pacific and Alaska, sometimes caused the lows to slow down, turn west or even take a track more northward to the Kamchatka Peninsula.

Tropical cyclones are normally least active during this period. Two western Pacific tropical cyclones only briefly affected OPC's oceanic analysis area, one in mid-January and the other at the end of April.

Tropical Activity

Tropical Storm Kulap: Kulap moved northwest into OPC's radiofacsimile map area near 16N 151E at 1800 UTC January 17 with maximum sustained winds 60 kts with gusts to 75 kts. The cyclone slowly weakened in the following twenty-four hours, became extratropical near 19N 154E at 0000 UTC on the 19th, then dissipated as a stationary remnant low on the 19th.

Typhoon Sonca: Sonca passed about 750 nmi south of Japan and entered OPC's oceanic map area at 0600 UTC April 26, with maximum sustained winds 90 kts with gusts to 110 kts. The cyclone moved northeast and weakened to a tropical storm twelve hours later, before becoming extratropical near 26N 143E at 0000 UTC April 27. The weak remnant low that was Sonca drifted east and persisted to the end of the month.

Other Significant Events

Northwest Pacific and Bering Sea Storm, January 1–3: The month began with storms tracking from near Japan to the western Bering Sea, while strong high pressure covered the northeast Pacific. ***Figure 1*** shows the development of the strongest of these, the 948 hPa hurricane-force

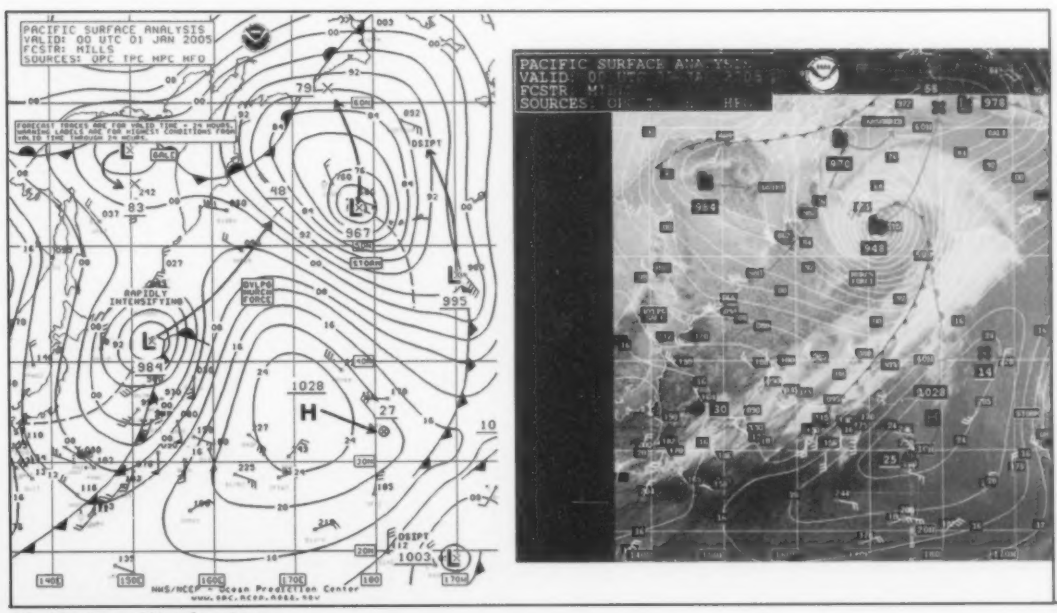


Figure 1. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC January 1 and 2, 2005. The second analysis valid 0000 UTC January 2 overlays a mosaic of GOES infrared satellite imagery. Satellite senses temperature on a scale from black (warm) to white (cold) in this type of image.

storm in the second part of the figure underlain with an infrared satellite image. The storm was at maximum intensity then, making it the second most intense (in terms of central pressure) in the North Pacific in the four-month period. The satellite image features the broad comma head, cloud spiral and well-defined center of an intense system (compare with ***Figure 4*** for the North Atlantic, about a storm of similar intensity). The strongest winds reported by ship was a south wind of 55 kts from **Soroe Maersk** (OYKJ2) (39N 160E) and **Oriental Bay** (MKYJ8) (39N 163E) at 0600 UTC and 1200 UTC January 1, respectively. Buoy 46071 (51.2N 179.2E) reported southwest winds as high as 45 kts at 0600 UTC on the 2nd, along with 12.0 m seas (40 ft). The maximum significant wave height at this buoy was 16.0 m (52 ft) three hours later. In the Bering Sea, the buoy 46035 (57.1N 177.6W) reported maximum winds out of the southwest at 50 kts and seas of 9.5 m (31 ft) at 1900 UTC January 2, followed by maximum seas of 10.5 m (34 ft) one hour later. QuikScat imagery in ***Figure 2*** reveals winds to 70 kts near the western Aleutians. The storm subsequently moved north of the area on the 3rd and weakened.

Western North Pacific Compact Storms, January 10–13: Two storms developed in close succession that were small but potent. ***Figure 3*** displays the development of the first to maximum intensity in the twenty-four hour period ending at 0000 UTC January 11. In the absence of any ship data, a QuikScat pass from 0749 UTC on the 10th (***Figure 4***) reveals a small area of winds to 80 kts south of the center. The cyclone then moved to the central Aleutians as a gale on the 12th before turning northwest under the influence of blocking high pressure to the northeast. The development of the second storm is implied by the 24-hour forecast track of the developing storm 35N 159E. The actual intensity was 970 hPa at 0000 UTC January 12 with the center near 43N 163E. There was ship data, with one ship in particular, **Manon** (SIWN), encountering southwest winds of 75 kts near 42N 167E at 0900 and 1200 UTC January 12. Reported seas were 13.0 m at 0900 UTC on the 12th. Another ship, **Ever Grade** (3FOW2), reported southwest winds of 40 kts and 11.5 m seas (38 ft) near 42.5N 171.6E at 0000 UTC on the 13th. The system then turned north by the 13th and weakened as a stronger low passed to the south.

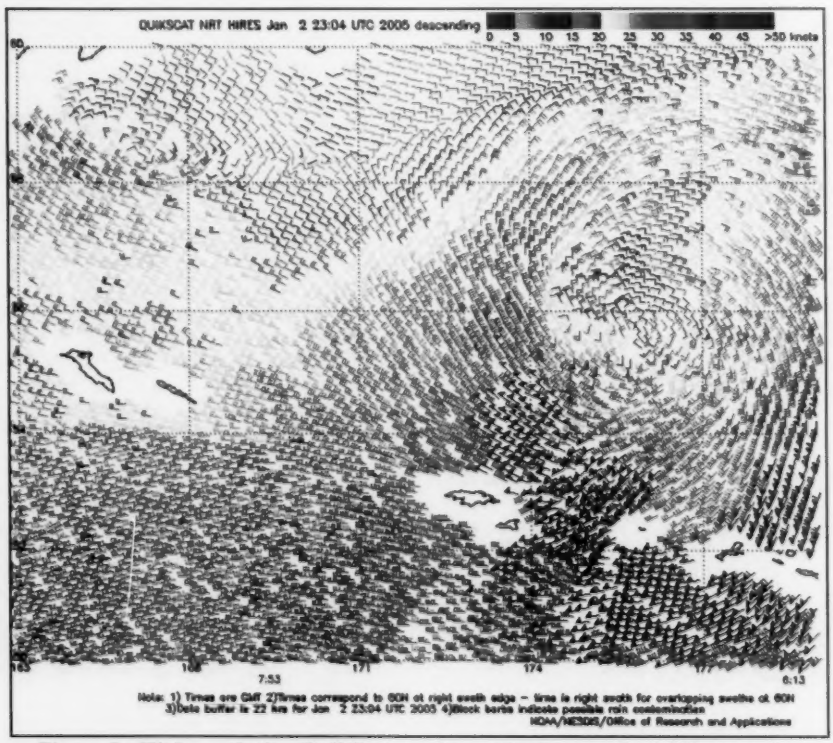


Figure 2. High-resolution QuikScat scatterometer image of satellite-sensed winds valid about 0753 UTC January 2, 2005, or almost eight hours later than the valid time of the second part of Figure 1. The resolution is 12.5 km, versus the 25 km resolution of regular QuikScat imagery.

Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

Western North Pacific Storm of January 11–16: This cyclone deepened rapidly at relatively low latitudes after passing east of Japan late on January 11, developing a 962 hPa central pressure near 39N 167E at 0600 UTC on the 13th. This was a drop of 32 hPa in twenty-four hours, impressive for that latitude. A QuikScat image valid at about this time suggested a marginal hurricane-force event. The cyclone then turned northeast and expanded in area while developing a lowest central pressure of 953 hPa at 0000 UTC on the 15th , near 42N 176E. **Sally Maersk** (OZHS2) (40N 168E) reported northwest winds of 50 kts six hours later. The system then drifted northeast while slowly weakening, and dissipating near the southwest Alaska coast by the 20th.

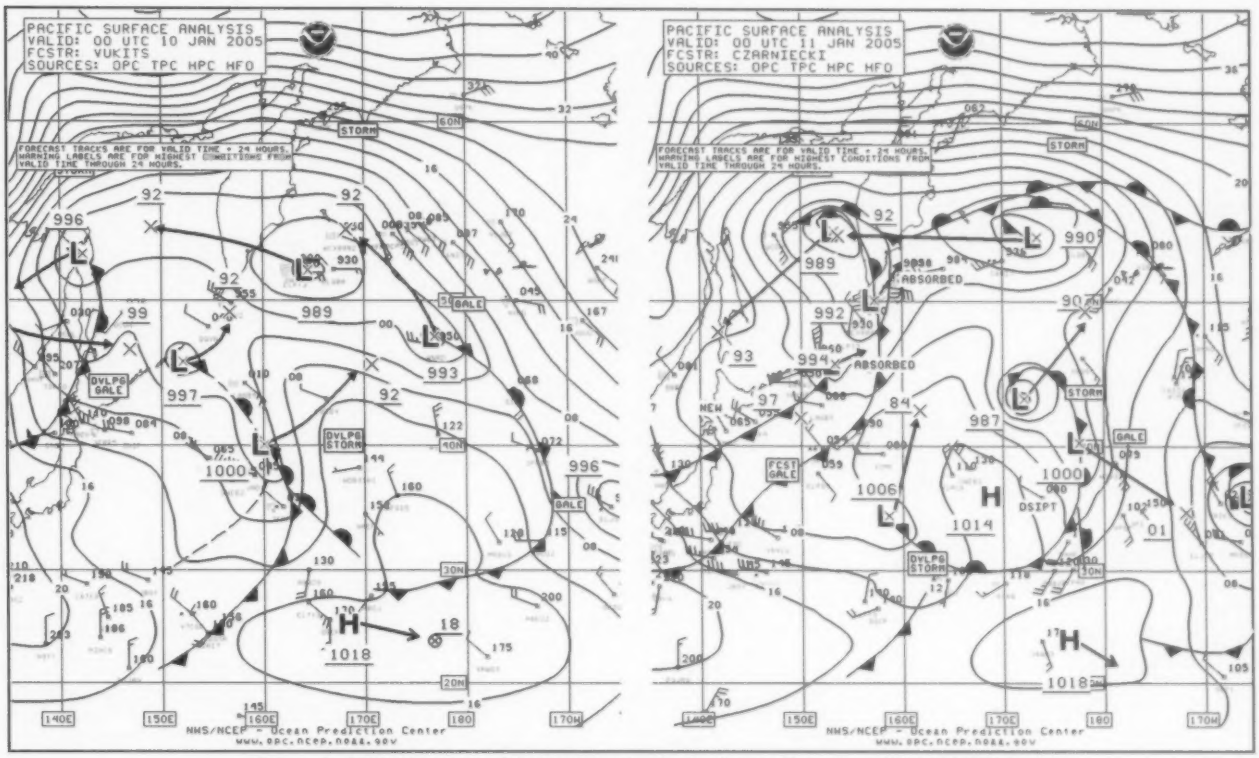


Figure 3. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC January 10 and 11, 2005. The development of a compact storm (43N 172E) is depicted.

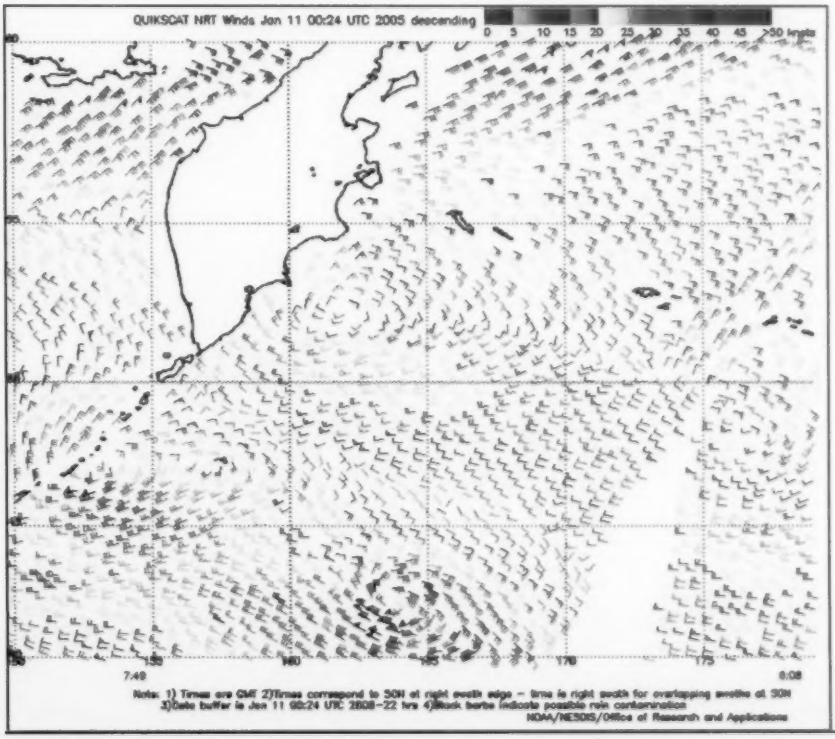


Figure 4. QuikScat scatterometer image of satellite-sensed winds around the compact storm shown in the second part of Figure 3. The resolution is 25 km. The valid time of the pass is 0749 UTC January 10, 2005, or almost eight hours later than the valid time of the first surface analysis in Figure 3.

Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

North Pacific Storm, January 26–29: The development of this major storm over a 48-hour period is depicted in ***Figure 5***, as a more marginal hurricane-force event was beginning to wind down to the north near 45N 174E (first part of ***Figure 5***). At 1200 UTC January 27 the **Ville de Sagitta** (DGCP) near 33N 173E reported northwest winds of 50 kts and 6.5 m seas (22 ft) as the hurricane-force storm was passing to the north. The second part of ***Figure 5*** shows the storm near maximum intensity. Six hours later the ship **Trade Foison** (V2AI7) (42N 157W) encountered southwest winds of 45 kts and 7.5 m seas (24 ft). A QuikScat pass valid about 0500 UTC on the 28th (***Figure 6***) reveals winds to 75 kts on the southeast side of the center, which was near 43N 167W. The system subsequently turned more north and began to weaken, stalled near 50N 165W on the 29th, then dissipated late on February 2.

Northwest Pacific Storm, February 1–4: ***Figure 7*** shows multiple low-pressure centers east and northeast of Japan consolidating into one intense storm in thirty-six hours, when it reached maximum intensity. The **Zim USA** (4XFO) is plotted in the second part of ***Figure 7*** with a northwest wind of 60 kts. Six hours later the same ship encountered west winds of 70 kts near 42N 157E. At 1200 UTC on the 3rd the **Swift Arrow** (C6NI7) reported northeast winds of 36 kts and a pressure of 958.7 hPa near 47.5N 158E. The **Punjab Senator** (DQVK) encountered west winds of 45 kts and 10.5 m seas (35 ft) near 41N 158E at that time. Blocked by high pressure to the north and northeast, the cyclone stalled and weakened to a gale on the 4th and dissipated early on February 8.

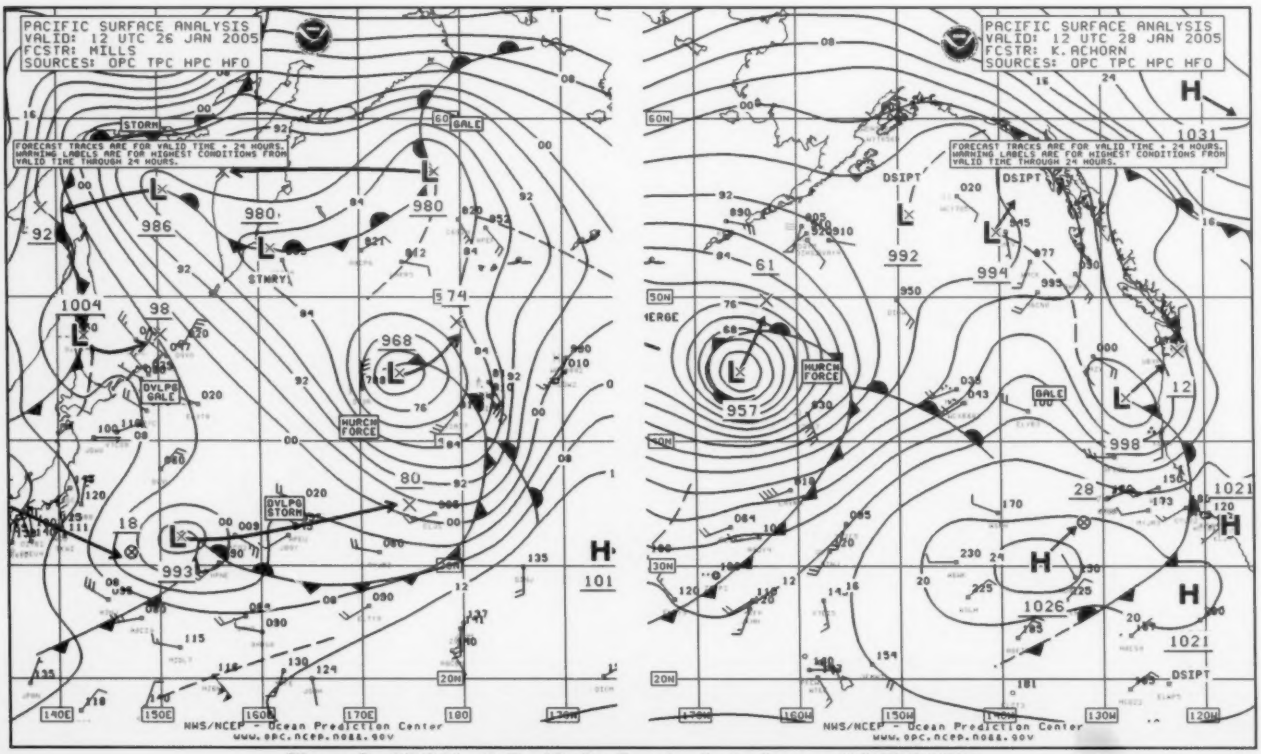


Figure 5. OPC North Pacific Surface Analysis charts valid 1200 UTC January 26 (Part 2) and 1200 UTC January 28, 2005 (Part 1).

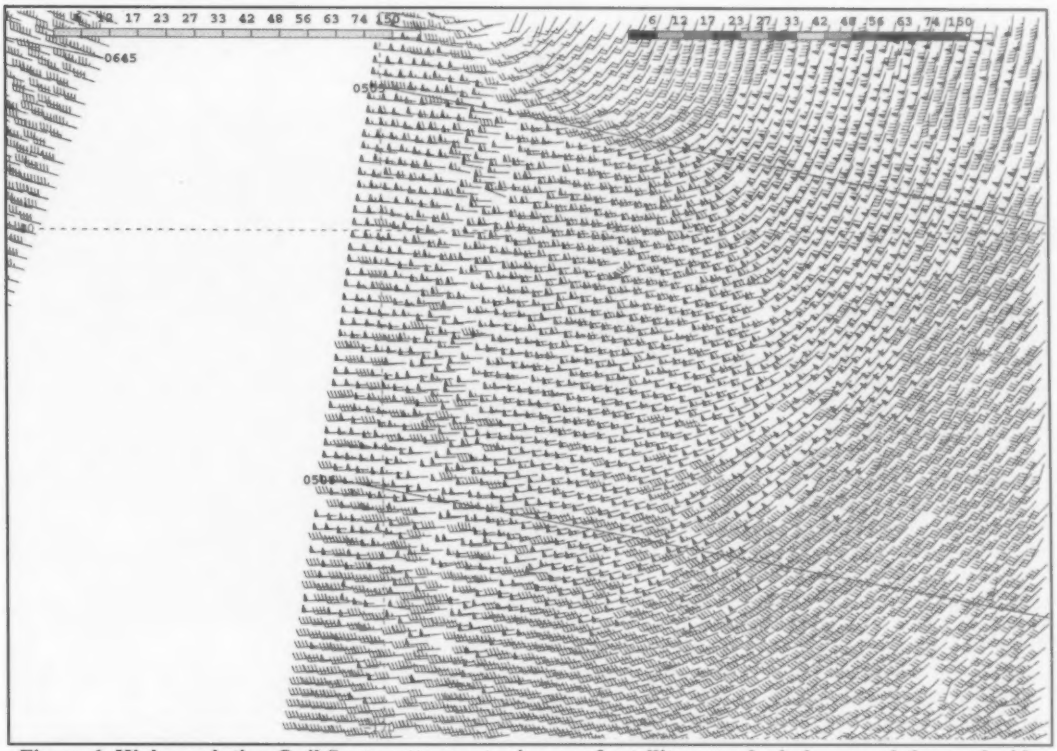


Figure 6. High-resolution QuikScat scatterometer image of satellite-sensed winds around the south side of the storm in *Figure 5*, valid about 0506 UTC January 28, 2005, or about seven hours prior to the valid time of the second part of *Figure 5*. The horizontal broken line is 40N Latitude and the solid numbered lines are satellite cross-track time lines (UTC).

Image is courtesy of NOAA/NESDIS /Office of Research and Applications, but the display is from an OPC workstation.

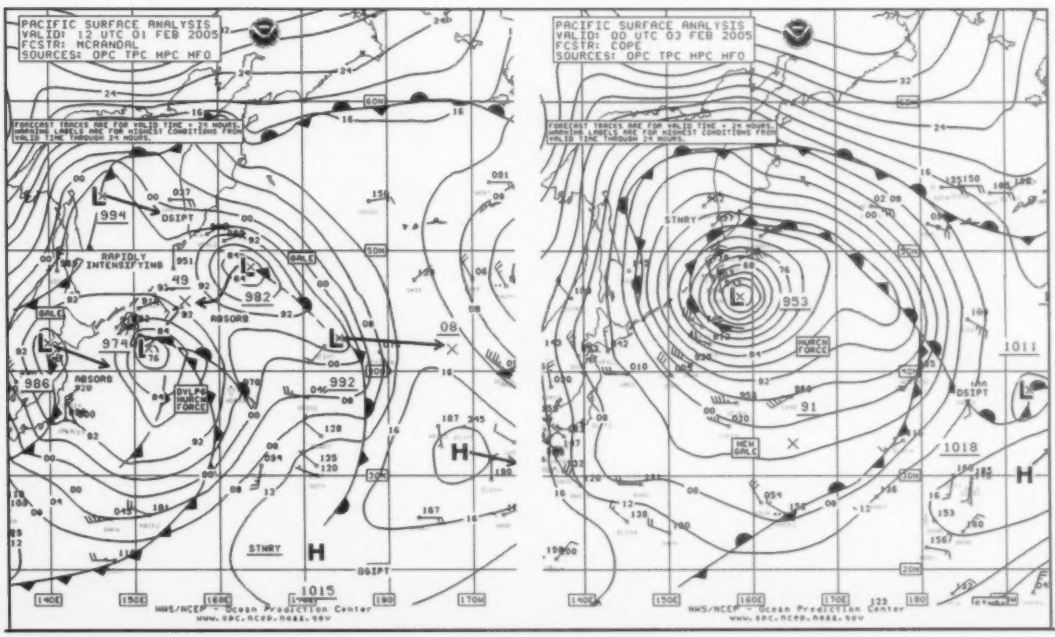


Figure 7. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC February 1 and 0000 UTC February 3, 2005.

North Pacific Storm, February 4–7: ***Figure 8*** shows a secondary low developing southeast of the old stalled system, and rapidly deepening to form the hurricane-force storm near the dateline twenty-four hours later. The central pressure dropped 33 hPa in this period, quite rapid for that latitude. The **Zim USA** (4XFO) reported northwest winds of 70 kts southwest of the storm center at 0600 UTC February 5 and is plotted in ***Figure 8***. The **Punjab Senator** (DQVK) had west winds of 55 kts and 11.5 m seas (37 ft) near 39.5N 179E at this time. The system subsequently turned north into the Bering Sea on the 6th, where it stalled and weakened.

North Pacific Storm, February 13–16: ***Figure 9*** shows the initial development of this storm over a 36-hour period. The central pressure dropped 37 hPa in the twenty-four hour period ending at 1800 UTC on the 14th. A QuikScat pass at 0748 UTC on the 14th is quite impressive, showing winds to 85 kts on the southwest side of the center (***Figure 10***). The **ship** (HREF) at 1200 UTC on the 14th reported west winds of 45 kts near 31N 167E, just outside the area of storm-force winds. As the storm's central pressure bottomed out at 964 hPa at 1200 UTC on the 15th, the **SeaLand Pacific** (WSRL) near 41N 172W reported southwest winds of 60 kts. The storm then moved into the eastern Bering Sea late on the 16th and weakened to a gale, followed by dissipation on the 17th.

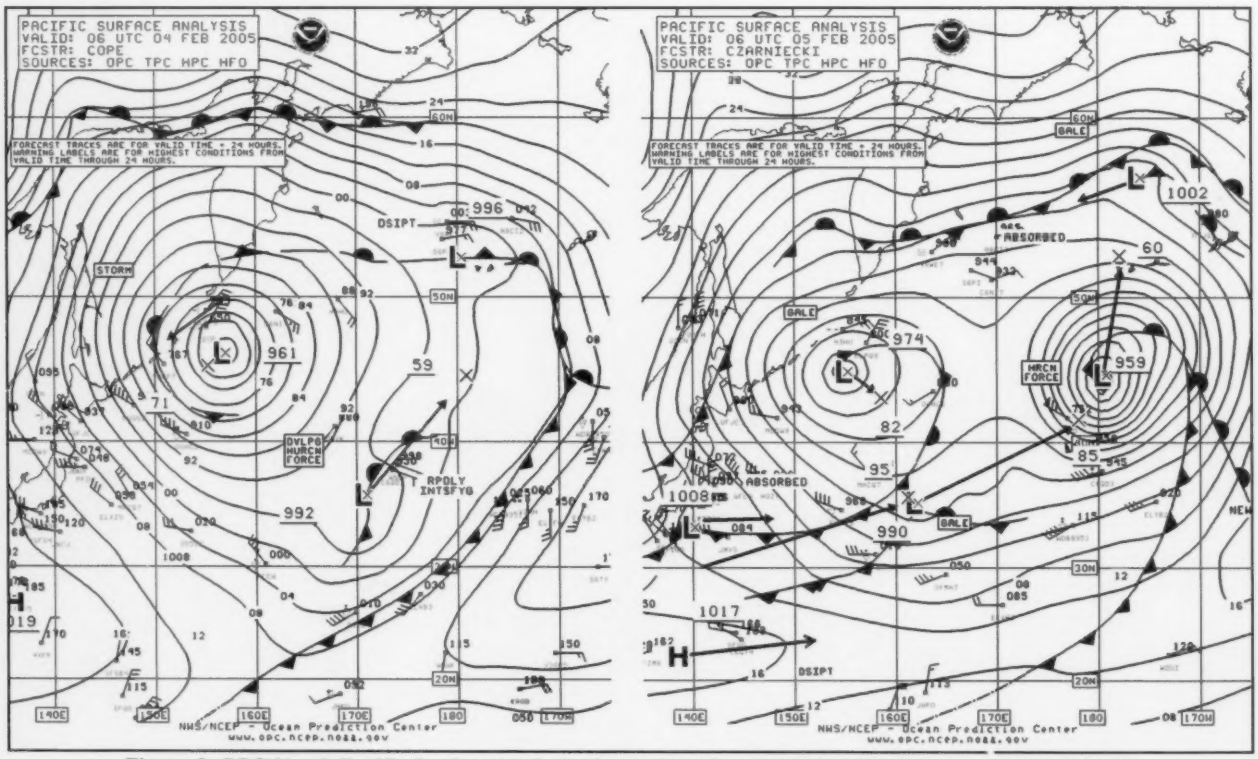


Figure 8. OPC North Pacific Surface Analysis charts (Part 2) valid 0600 UTC February 4 and 5, 2005.

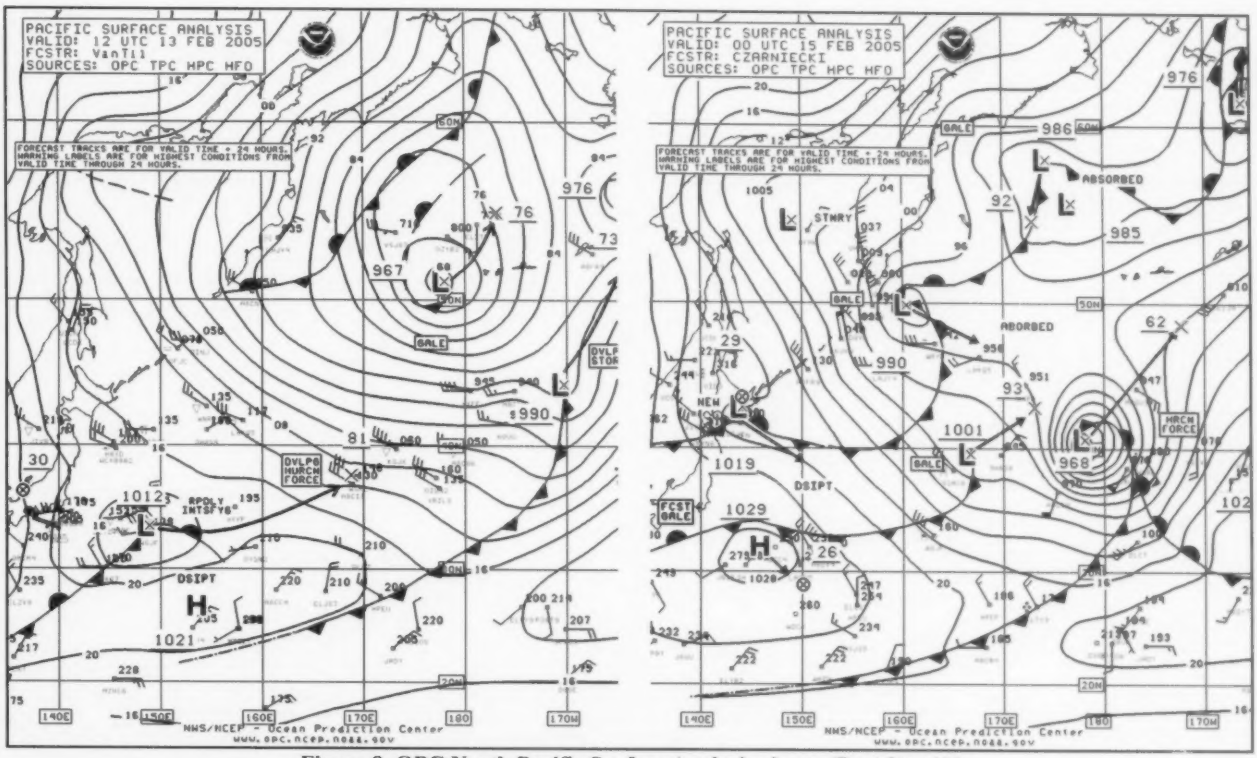


Figure 9. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC February 13 and 0000 UTC February 15, 2005.

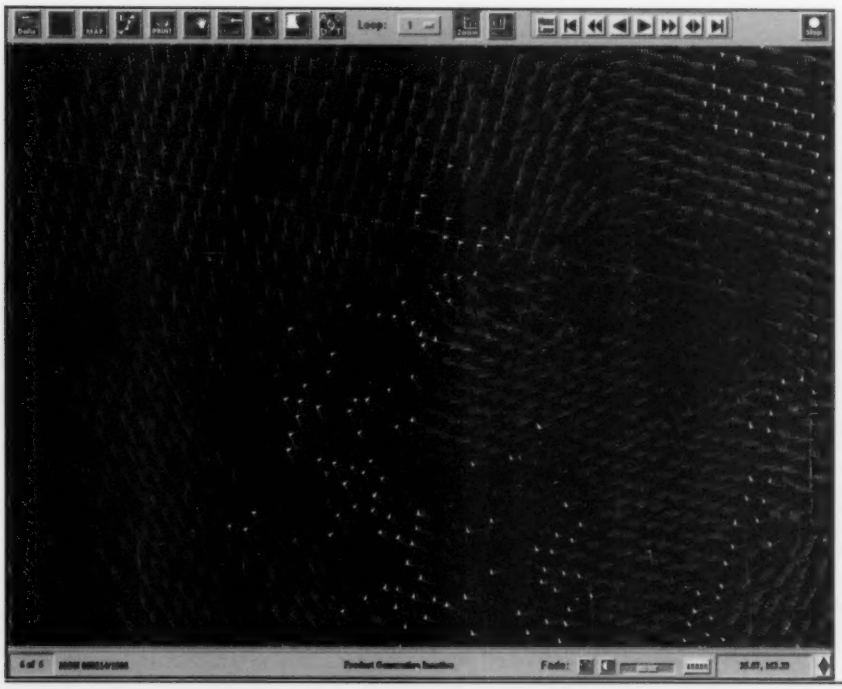


Figure 10. High-resolution QuikScat scatterometer image of satellite-sensed winds around the southwest side of the storm in *Figure 9*, valid about 0748 UTC February 14, 2005, or about sixteen hours prior to the valid time of the second part of *Figure 9*. The type of image and source are the same as in *Figure 6*.

North Pacific Storms, February 17–19: Two other storms followed similar tracks into the eastern Bering Sea as shown in ***Figure 11***, with the first storm at maximum intensity as it entered the Bering Sea (first part of ***Figure 11***). The ship **Trade Rainbow** (V2MH) (46N 172W) reported southwest winds of 60 kts at that time. Buoy 46075 (53.9N 160.8W) reported seas as high as 11.0 m (35 ft) at 1100 UTC on the 18th. A QuikScat image valid about 1600 UTC on the 17th revealed a small area of 65 to 75 kts wind south of the center. The stronger second storm is shown crossing the dateline in ***Figure 11*** with a lowest central pressure of 958 hPa. Available ship data had winds 35 kts or less, with the Portugal Senator (DQVO) reporting the highest seas (11.5 m or 37 ft) near 49N 168W at 0000 UTC on the 20th. A QuikScat pass valid about six hours prior to the time of the second part of ***Figure 11*** is much more revealing, showing a large area of 65 kts or greater south and southwest of the center (***Figure 12***). There is even a 90 kts wind barb near the dateline. The storm subsequently weakened to a gale near the eastern Aleutians on February 19, before becoming stationary in the southern Bering Sea on the 20th.

North Pacific Storm, February 24–27: This storm originated south of Japan early on February 24 and quickly developed hurricane-force winds as the center passed 36N 153E at 0600 UTC on the 25th. High-resolution QuikScat data was available for about that time and revealed winds up to 85 kts southwest of the center, but is not shown here since it resembles the image in ***Figure 10***, for the February 13–16 event. The ship **Canmar Promise** (DGSG) (34N 157E) reported southwest winds of 55 kts at 1200 UTC on the 25th. The lowest central pressure was 965 hPa when the center was at 46N 178E at 1200 UTC on the 26th. The cyclone subsequently turned east along 45N and weakened to a gale on February 27.

North Pacific Storms, March 2–8: Two storms took southwest to northeast tracks from east of Japan before crossing 50N south of Alaska, where they slowed and turned more northwest. ***Figure 13*** shows the first storm in its period of most rapid deepening, when the central pressure dropped 32 hPa in twenty-four hours. Ship data was lacking, but a QuikScat pass at about 0600 UTC March 3 showed winds to 75 kts south of the center. The central pressure bottomed out at 953 hPa near 50N 158W at 0600 UTC March 4. It is interesting to note that OPC ran an experimental model

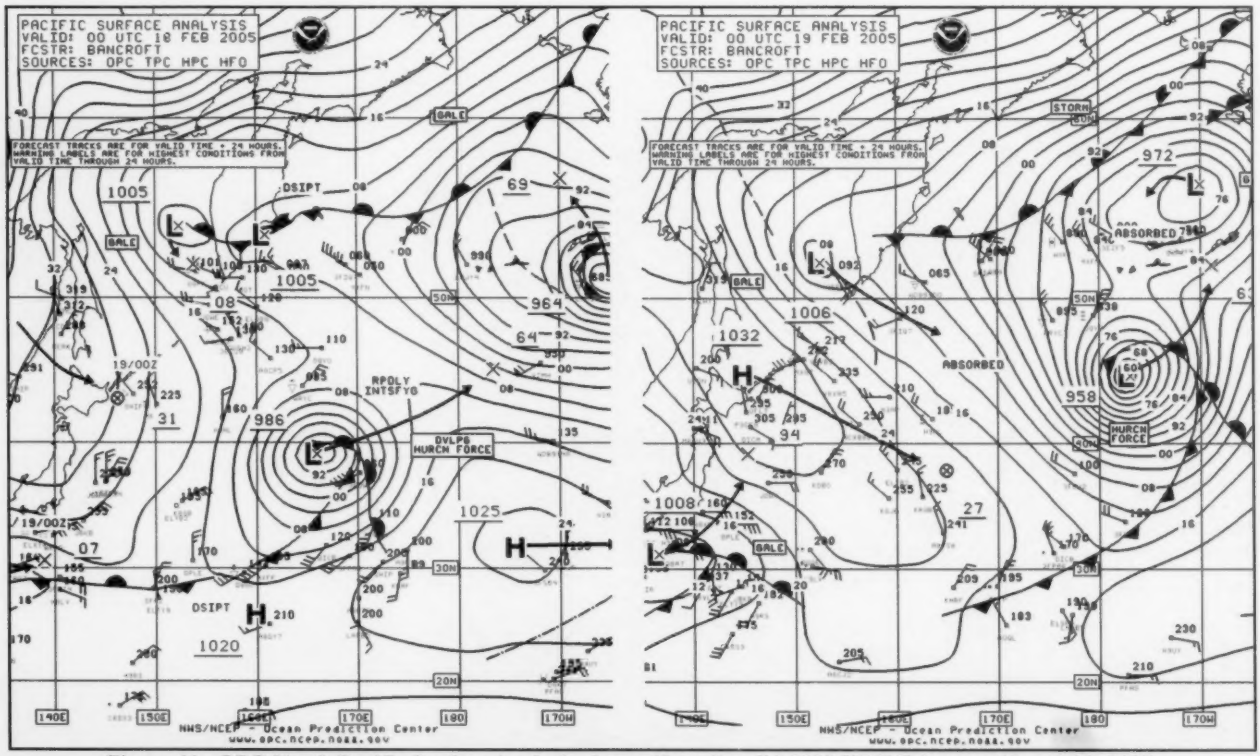


Figure 11. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC February 18 and 19, 2005.

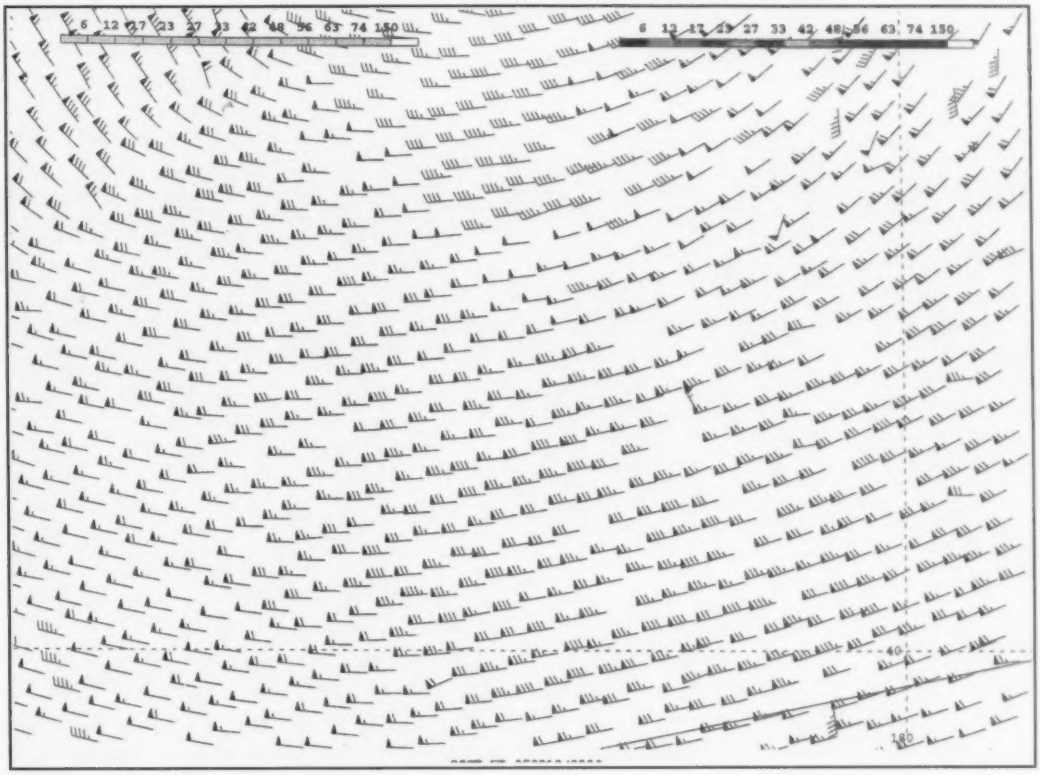


Figure 12. High-resolution QuikScat scatterometer image of satellite-sensed winds around the south side of the storm in *Figure 11*, valid about 1800 UTC February 18, 2005, or about six hours prior to the valid time of the second part of *Figure 11*. The horizontal and vertical broken lines are 40N Latitude and 180 degrees Longitude, respectively. The type of image and source are the same as in *Figure 6*.

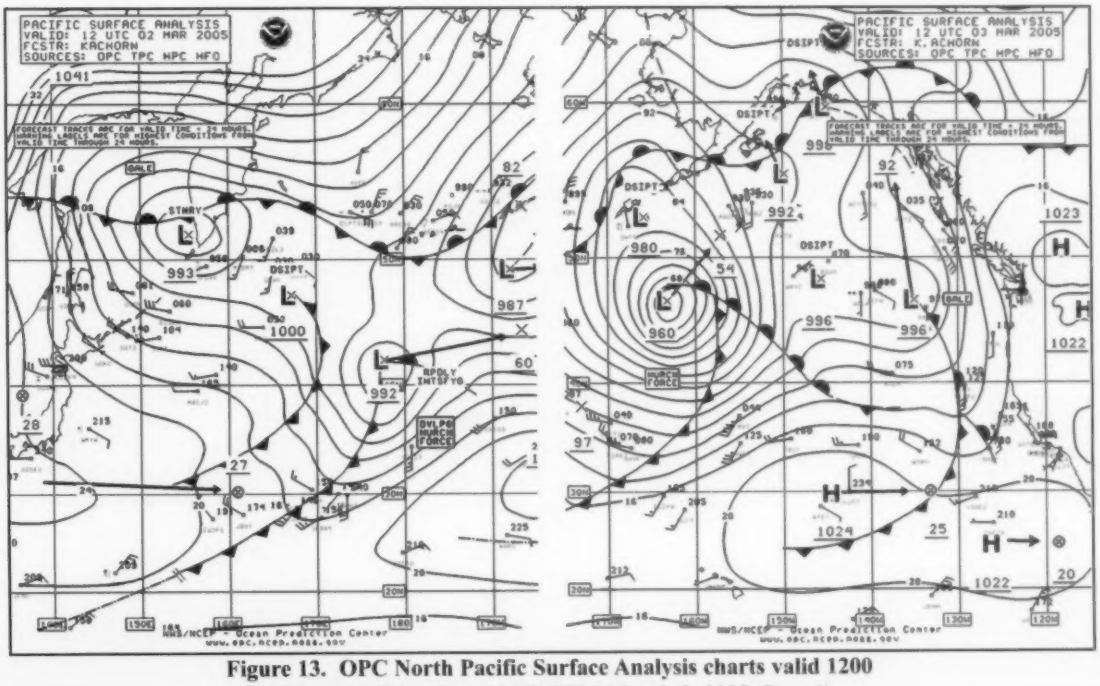


Figure 13. OPC North Pacific Surface Analysis charts valid 1200 UTC March 2 (Part 2) and 1200 UTC March 3, 2005 (Part 1).

retrieval of the sea-level pressure around this storm using QuikScat winds, and found a central pressure of 946 hPa (27.94 in) at 1800 UTC on the 3rd (***Reference 1***). That would be the lowest pressure of the period in the North Pacific. The storm subsequently weakened to a gale near the southwest Alaska coast later on the 4th and drifted west. The second storm was similar, developing a lowest pressure of 952 hPa near 45N 158W at 1200 UTC on March 7. The ship **APL Sweden** (9VYY5) (41N 175W) reported northeast winds of 55 kts and 10.5 m seas (35 ft) at 0600 UTC on the 6th. At 0000 UTC March 8 **Hanjin Vienna** (DIBZ) (42N 154W) encountered west winds 45 kts and 11.5 m seas (37 ft).

Eastern North Pacific Storm, March 8–10: A storm developed near the dateline near 32N and moved northeast, before turning north along 150W on the 9th. Winds briefly reached hurricane force southeast of the center late on the 9th, based marginal 65 kts wind barbs on the high-resolution QuikScat evening pass. The lowest central pressure was 956 hPa at 0600 UTC March 10 near 52N 149W. Six hours later the ship **OOCL Friendship** (VRWD3) (53N 151W) encountered southwest winds of 60 kts. The cyclone then moved inland and rapidly weakened late on the 10th.

Eastern North Pacific Storm, April 7–8: This event consisted of a southeastward redevelopment of a Bering Sea low, resulting in a storm at 45N 132W (993 hPa) at 0600 UTC on April 8 approaching the U.S. Pacific Northwest offshore waters. A high-resolution QuikScat pass valid about 0300 UTC April showed west winds up to 60 kts south of the center. The ship **APL Philippines** (WCX8884) (45N 135W) encountered northwest winds of 55 kts and 8.0 m seas (26 ft) at 1200 UTC on the 8th. Six hours later another ship, **Sealand Developer** (KHRH) (41N 130W), had northwest winds of 50 kts and 9.0 m seas (30 ft). By 0400 UTC on the 9th seas reached 7.5 m (25 ft) at Buoy 46014 near Point Arena. Later, a swell at 46047 (32.5N 119.5W) off southern California reached 6.5 m (21 ft).

North Pacific Storm, April 20–22: This late-season hurricane-force storm originated down near 33N near the dateline and tracked northeast toward the eastern Aleutians. ***Figure 14*** shows the period of most rapid intensification when the central pressure

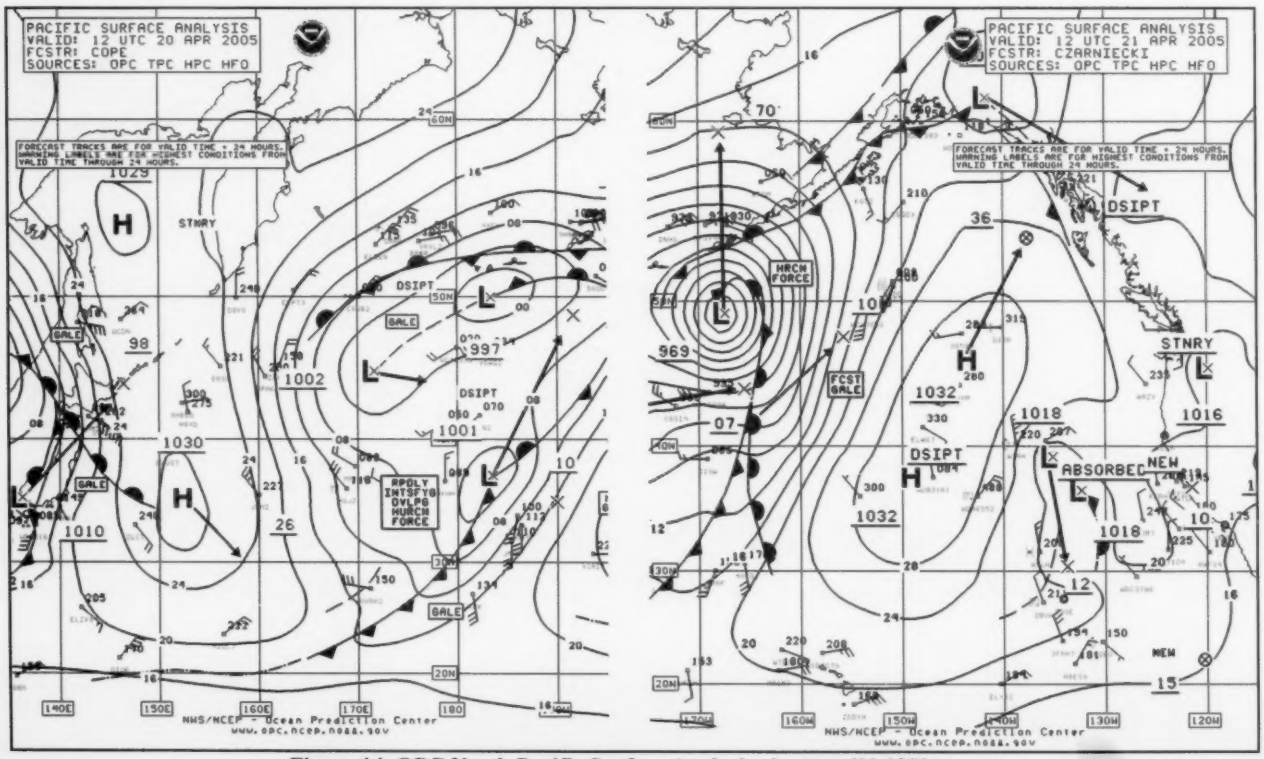


Figure 14. OPC North Pacific Surface Analysis charts valid 1200 UTC April 20 (Part 2) and 1200 UTC April 21, 2005 (Part 1).

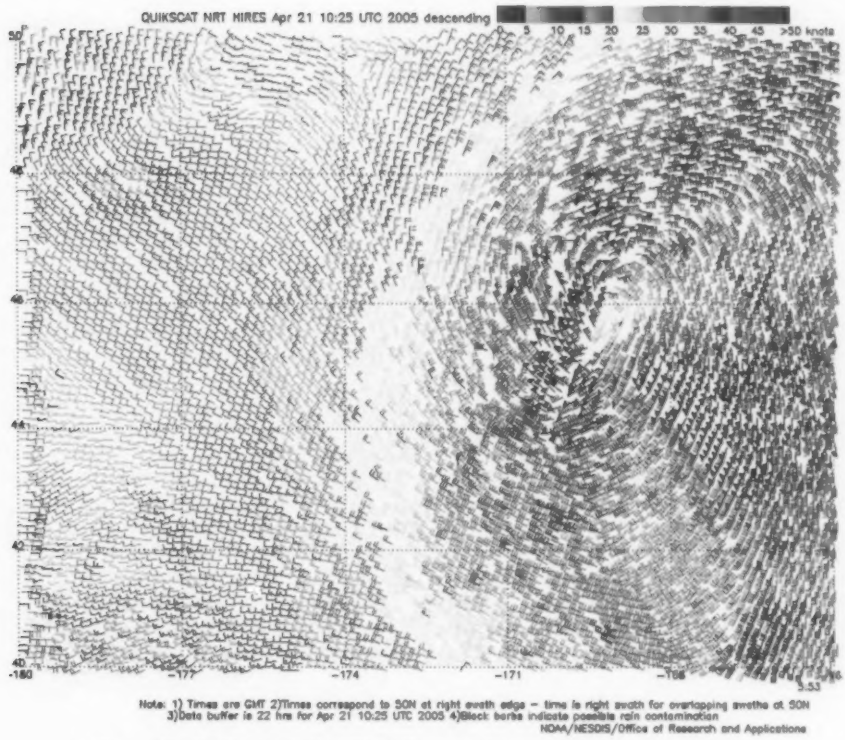


Figure15. High-resolution QuikScat scatterometer image of satellite-sensed winds valid about 0553 UTC April 21, 2005, or about six hours prior to the valid time of the second part of Figure 14.

Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

dropped 32 hPa in twenty-four hours. The lowest central pressure was 967 hPa near 53N 166W six hours later. The **Sinuk** (WCQ8110) encountered south winds of 70 kts near 57N 159W at 0000 UTC on the 22nd. The vessel **Hanjin Philadelphia** (A8CN8) (53.3N 160W) reported south winds of 55 kts and 10.5 m seas (35 ft) at the same time. Buoy 46075 (54N 160.8W) reported seas as high as 11.5 m (37 ft) at 2300 UTC April 21. A high-resolution QuikScat pass (***Figure 15***) shows a small area of 65 kts southwest of the well-defined storm center at 46N 169W. The cyclone subsequently weakened to a gale in the Bering Sea and then reached the Bering Strait late on the 22nd.

Reference

1. E-mail communication: Sienkiewicz, Joseph, SLP retrievals using QuikScat and UW PBL model, April 8, 2005.

Marine Weather Review—Tropical Atlantic and Tropical East Pacific Areas January through May 2005

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Significant Weather of the Period

Atlantic, Caribbean and Gulf of Mexico: January through May 2005 was a very active period in terms of the number of gale and storm events across the subtropical and tropical Atlantic Basin. A total of 22 events occurred during the period. Many of these events were associated with strong cold fronts that moved off the southeast United States coast and affected the Gulf of Mexico or the western Atlantic. However, only three events occurred in January, which is usually a very active month. February and March turned out to be a very active period with fifteen events occurring during the two-month period. A western Atlantic storm event in early February produced strong gales well south into the TPC forecast area. This event also brought strong winds to Bermuda. Three additional events occurred in April and two in May. The event in mid-April produced very large swells that impacted the east coast of Florida, the Bahamas, and Puerto Rico. Details of the early February and mid-April events are provided .

Western Atlantic Storm January 31–February 6: The strongest event of the period was produced by a strong low that produced gale to storm conditions across the western Atlantic between 31 January and 5 February. The precursor to the western Atlantic low was a low that developed along the northern Gulf of Mexico coast on 28 January. The low moved eastward on the 29th and weakened over the northeast Gulf. On the 30th, a second low began to form off the coast of South Carolina. This low quickly strengthened, becoming a gale off the coast of North Carolina. At 0600 UTC 31 January, the 1002 hPa low was centered about 225 nmi east of Cape Hatteras. At this time, the low began producing storm force winds off the North Carolina coast. The track of the low was then somewhat atypical moving east-southeastwards towards Bermuda.

At 0000 UTC 1 February, the 1000 hPa storm center was located just north of Bermuda. Shortly after this time, gale force winds began over the Tropical Prediction Center's area of responsibility. Most of the strong winds occurred to the west and southwest of the storm center. At 1800 UTC, the ship **Cap San Nicolas** (ELYX3) reported 35-kts winds near 28N 62W. The low slowed as it moved east of Bermuda on the 1st. As the low passed the island, gale-force wind gusts or higher were observed for about 48 hours. Reports from Bermuda indicate that the sustained winds reached a peak value of 43 kts with gusts to 61 kts around 1000 UTC 2 February. At 1200 UTC 2 February, the ship **Lykes Explorer** (WGLA) reported 60-kts winds just northwest of Bermuda while the **Cap San Nicolas** (ELYX3) observed 40 kts winds near 31N 65W. Gale force winds well west and southwest of the low were detected by a QuikSCAT pass around 1145 UTC 2 February (***Figure 1***).

However, the area of storm force winds encountered by the **Lykes Explorer** (WGLA) was located between the two QuikSCAT passes. ***This provided an excellent case to demonstrate the importance of accurate ship observations.*** Even with QuikSCAT data routinely available to marine forecasters, in this situation the storm force observation from the **Lykes Explorer** (WGLA) was extremely critical to the warning and forecast process.

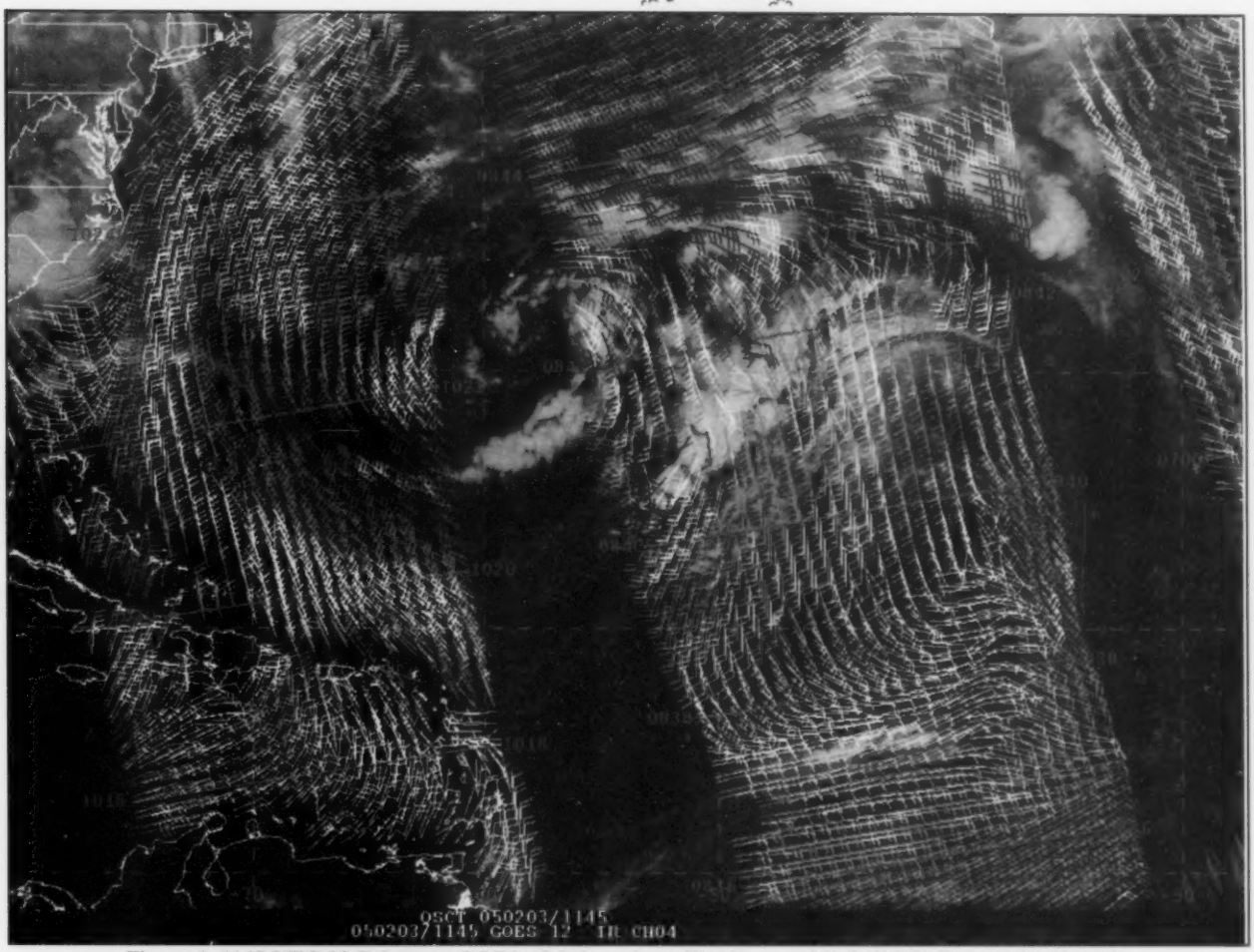


Figure 1. 1145 UTC 03 February GOES-12 infrared satellite image with QuikSCAT overlaid. Note the area of strong winds well southwest of the low that is centered between the two QuikSCAT passes.

By 0000 UTC 3 February, the 991 hPa low was near 31N 59W. At this time winds of 30 to 40 kts were occurring north of 26N between 50W and 70W. The ship **Chiquita Schweiz** (C6KD9) encountered 35-kts winds near 26N 55W. In addition to the winds, the low also created very large swells that effected the western Atlantic as far south as Puerto Rico and the northern Leeward Islands. These swells produced breaking waves of 4–5 m (14–17 ft) along the north coast of Puerto Rico on the 4th. The low finally weakened and moved slowly northward on the 4th. At 0000 UTC 5 February, the low was centered near 35N 55W. At this time, winds south of the 31N decreased below gale force. The low continued to slowly move north, eventually weakening and dissipating near 40N 53W on the 7th.

Western Atlantic Storm April 14–17: The incipient low pressure that produced this storm event developed over the central United States. The low then tracked east-southeastward across Kentucky and the Carolinas early on the 13th. Around 1800 UTC 13 April, it moved off the coast of North Carolina near Wilmington. Once offshore, the low quickly strengthened into a gale center then it became nearly stationary about 250 nmi southeast of Cape Hatteras. At this time, gales were occurring to the northwest and north of the low. By 0600 UTC 15 April, the low strengthened into a storm center and began to move slowly southeastward. At 1800 UTC, the 1004 hPa storm was centered near 33N 73W. At this time, gale force winds began in the Tropical Prediction Center's

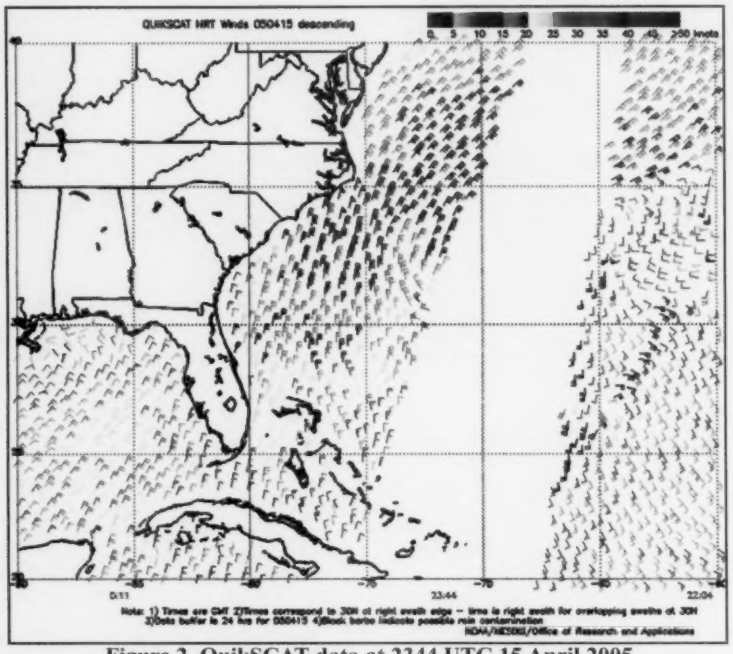


Figure 2. QuikSCAT data at 2344 UTC 15 April 2005.

marine area. QuikSCAT data at 2344 UTC 15 April (***Figure 2***) indicated storm force winds off the coast of North Carolina with gale force winds extending south to about 29N.

The low's slow movement and large fetch of strong winds created ideal conditions to build very large seas. Buoy 41002 (32.3N 75.4W) reported a maximum significant wave height of 7.8 m (26 ft) around 0400 UTC 16 April. At this time, the low was centered about 240 nmi east-southeast of the buoy (***Figure 3***). Large swells propagated well southward and effected much of the east coast of Florida and the Bahamas. Buoy 41010 (28.9N 78.5W) located 120 nmi east of Cape Canaveral reported seas above 3 m (10 ft) for about 60 consecutive hours, beginning around 1000 UTC 15 April. The significant wave height at the buoy peaked at 5.3 m (17 ft) at 0900 UTC 16 April. NOAA Buoy 41009 (28.5N 80.2W) closer to shore, about 20 nmi east of Cape Canaveral, reported wave heights between 3.5 and 4 m (11-13 ft) between 0600 UTC April 16 and 1900 UTC 17 April. This is the same storm system that produced the rogue wave that damaged the **Norwegian Dawn** (C6FT7) early on 16 April.

Late on the 16th the storm center began moving east-northeastward. At 0000 UTC 17 April, the storm weakened to a gale near 32N 70W. Shortly after this time, gale conditions ended south of 31N. Large northerly swells continued to affect the southwest North Atlantic through the 18th.

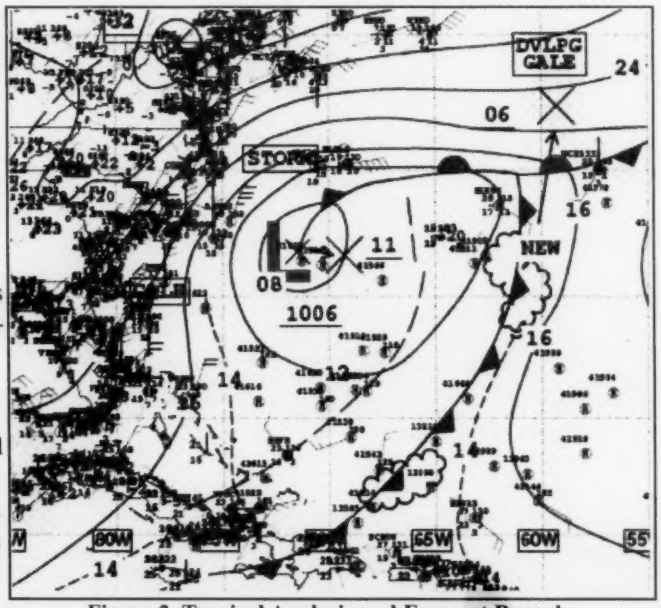


Figure 3. Tropical Analysis and Forecast Branch Surface Analysis at 0600 UTC 16 April.

Eastern North Pacific

Gulf of Tehuantepec Events: The first Gulf of Tehuantepec gale event of calendar year 2005 began around 0600 UTC 9 January and lasted approximately 54 hours until 1200 UTC 11 January. QUIKSCAT first captured the core of the wind field at 1218 UTC 10 January. This pass indicated 40–45 kt winds in the Gulf of Tehuantepec. A subsequent pass at 0050 UTC 11 January indicated that winds were barely gale force in the area. One ship reported gale force winds, the ship with call sign **Ship** (V2IA01) located near 13.5N 94.0W reported 35 kts winds and seas of 4.5 m (15 ft) at 1800 UTC 10 January.

The first storm event for the year began around 0600 UTC 14 January and lasted for nearly a week, finally ending 0000 UTC 21 January. The extended duration of the event produced one of the largest gale force wind fields associated with a Gulf of Tehuantepec gale event in the six-year period 1999-2005. The first

QUIKSCAT indication of gale-force winds was at 1215 UTC 14 January, with winds of 40–45 kts winds in the Gulf of Tehuantepec. Subsequent passes on 15 January indicated an expansion of the wind field southwestward to 10N and 100W. By 17 January, the area of enhanced winds had spread further, and extended from 5N to 10N westward to 110W. There were several ships that reported gale-force winds or greater during this prolonged event. The first ship report of gale-force winds occurred at 1200 UTC 15 January. The ship **Magelby Maersk** (OUSH2) reported NNE winds of 35 kts while located near 14N 95W. The gale was upgraded to a storm at 1800 UTC 15 January based on the ship **Overseas Joyce** (WUQL) report of 55-kts winds while located near 15N and 95W. Other ship reports included 45 kts from **Ship** (DLHZ) at 0000 UTC 16 January while located near 15N 95W. This ship reported 4.5 m (16 ft) seas as well. The **Maersk Denver** (A8EH2) also reported storm-force winds with this event. This ship reported 50-kts winds and 3.3 m (11 ft) seas at 1200 UTC 17 January while located near 14.5N 95W. A testament to the extent of the gale-force winds with this prolonged event was given by the ship **Singapore Bay** (MRGU3) which reported 35-kts winds at 1200 UTC 18 January while located near 12.5N 98W, about 350 nmi from the Gulf of Tehuantepec. The last ship report of gale-force winds with this event was received at 1800 UTC 20 January. The ship **Dagmar Maersk** (DHAF) reported 35-kts winds while located near 14N 95.5W.

The third event of the year was very short lived, lasting only 30 hours from 0600 UTC 24 January to 1200 UTC 25 January and was probably a marginal gale event. It was the weakest of the events during the period. There were no 25 km resolution QUIKSCAT passes of gale-force winds associated with this event and no ship reports of gale-force winds.

There were only two Gulf of Tehuantepec gale events during February, an abnormally low number. The first event began 0000 UTC 3 February and lasted more than three days, finally ending around 1200 UTC 6 February. A 0055 UTC 3 February QUIKSCAT pass indicated 35-kts winds in the Gulf of Tehuantepec. A subsequent QUIKSCAT pass at 0029 UTC 4 February indicated 50-kts winds in the Gulf of Tehuantepec, and the event was upgraded to a storm based on this information. A 0003 UTC 5 February QUIKSCAT pass indicated 40–45 kt winds remained in the area, nearly 24 hours after storm force winds were detected. One ship reported gale-force winds at 1800 UTC 5 February, the ship **Rickmers Seoul** (V7EI5) reported easterly winds of 40 kts and seas of 4.5 m (15 ft) while located near 14.5N 96W.

The next wind event commenced a week later around 1200 UTC 10 February and persisted for a little more than 48 hours, ending around 1800 UTC 12 February. An 1150 UTC 11 February QUIKSCAT pass indicated 40 kts winds in the Gulf of Tehuantepec. A subsequent pass at 0022 UTC 12 February showed that 40 kts winds persisted in the region. There were two ship reports of gale force winds associated with this event. The first, the **Martorell** (HPNE), reported 35-kts winds and 4.3 m (14 ft) seas at 1800 UTC 10 February while located near 14.7N 95.2W. The second ship, **Legend of the Seas** (C6SL5), reported NNE winds of 40 kts and 5 m (17 ft) seas at 06 UTC 12 February while located near 14.2N 94.5W.

Nearly a month elapsed between gale events, with the sixth event of 2005 beginning around 1200 UTC 10 March and lasting a mere 18 hours until 0600 UTC 11 March. An 1151 UTC QUIKSCAT pass on the 10th of March was the basis for the beginning of this event. This pass indicated 35–40 kts winds in the Gulf of Tehuantepec. There were no ships reporting winds of gale force with this event. The last event in March began 0000 UTC 28 March and continued for about 24 hours. A 1225 UTC 28 March QUIKSCAT pass indicated a marginal gale of 35 kts was in progress. No ship reports of gale force were noted with this event. However, the ship **Sealand Patriot** (KHRF) reported 30-kts winds at 1200 UTC 28 March while located near 14.8N 95.5W.

The first event for the month of April was a typical late season storm event. This event was very similar in strength to the hurricane force wind event which occurred on 30–31 March 2003 and was the strongest event to occur during the January to April 2005 period. The event lasted only 42 hours from 0000 UTC 2 April to 1800 UTC 3 April. Despite the brief nature of the event, hurricane force winds of 65 kts were noted on two high-resolution (12.5 km) QUIKSCAT passes at 0100 UTC and 1300 UTC 3 April (***Figure 4***.) The ship **Legend of the Seas** (C6SL5) was the first to report gale force winds (NNW 35 kts) at 0600 UTC 2

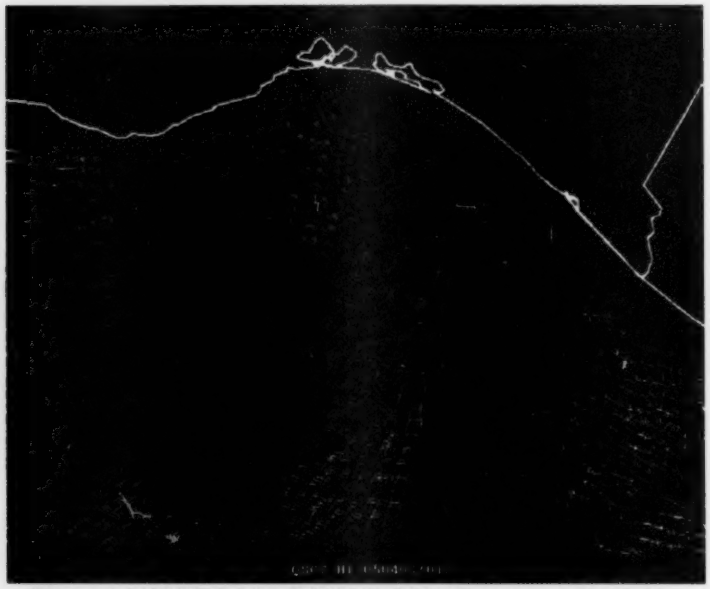


Figure 4. 0120 UTC 3 April 2005 QuikSCAT pass over the Gulf of Tehuantepec indicating a large area of storm force (>48 kt) winds with a few winds of hurricane force (65 kt). This was only the second time hurricane force winds have been observed in the Gulf of Tehuantepec since the advent of QuikSCAT data in 1999.

April while located near 14.5N 94W. Six hours later the first report of storm force winds came from **CSAV Yokohama** (DGVC). The ship reported 60-kts winds while located near 13N 98W. The ship **CMA CGM Vernet** (DGCP) reported northerly winds of 40 kts and 8 m (26 ft) seas at 1800 UTC 2 April while located near 13.8N 95.5W. Six hours later the ship **Singapore Bay** (MRGU3) reported north-northeasterly winds of 35 kts and 4 m (13 ft) seas near 11.5N 95.5W, about 275 nmi SSW of the Gulf of Tehuantepec, showing once again how quickly the wind field had spread out during this exceptionally strong event.

The final gale event for the spring season 2005 began two weeks later around 0000 UTC 16 April and lasted 60 hours, until 1200 UTC 18 April. A 1215 UTC 16 April QUIKSCAT pass was the first to indicate gale force winds (35–40 kts) associated with this event. The next QUIKSCAT pass at 1207 UTC 17 April over the area indicated winds had increased to 40–45 kts. A subsequent pass at 0039 UTC 18 April indicated winds had dropped just below gale force. ***Table 1*** lists gale and storm events for the Gulf of Tehuantepec.

Gulf of Papagayo gale February 11–12 : A short lived gale event occurred in the Gulf of Papagayo. The gale event began around 1200 UTC 11 February and ended 18 hours later. This wind event is particularly noteworthy as sustained winds of gale force are a rare occurrence in this region. An 1150 UTC 11 February 25 km resolution QUIKSCAT pass indicated a swath of 25–30 kts winds in the region. High resolution data indicated a few 35 kts wind barbs in association with this wind event and gale warnings were issued for the region. Although there were no ship reports of gale force winds during this event, the ship **Martorell** reported northeast winds of 30 kts and 9 ft seas at 1200 UTC 11 February while located near 11.3N 90W. Over the next 12 hours, the ship reported similar conditions as it traversed east-southeastward to near 9.8 N 87.0 W. The course of the ship was never closer than 180 nmi to the Gulf of Papagayo, and it is believed that gale force winds occurred further east in the Gulf itself.

Event	Beginning	Ending
1	0600 UTC 9 January	1200 UTC 11 January
2*	0600 UTC 14 January	0000 UTC 21 January
3	0600 UTC 24 January	1200 UTC 25 January
4*	0000 UTC 3 February	1200 UTC 06 February
5	1200 UTC 10 February	1800 UTC 12 February
6	1200 UTC 10 March	0600 UTC 11 March
7	0000 UTC 28 March	0000 UTC 29 March
8**	0000 UTC 02 April	1800 UTC 03 April
9	0000 UTC 16 April	1200 UTC 18 April

Table 1. Estimated beginning and ending times for Gulf of Tehuantepec gale and storm events from January through May, 2005. Storm events are denoted with an asterisk (*). Hurricane force wind events are denoted with two asterisks (**).

Mean Circulation Highlights and Climate Anomalies January through April 2005

A. James Wagner, Senior Forecaster, Climate Operations Branch, Climate Prediction Center /NCEP/NWS/NOAA.

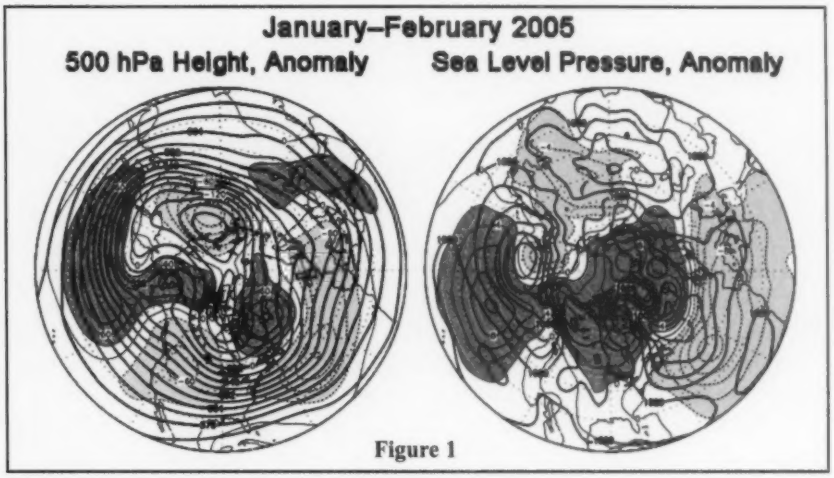


Figure 1

Figure legends and description of units:

The charts show the seasonal mean 500 hPa height contours at 60 m intervals in heavy solid lines, with alternate contours labeled in decameters (dm). Positive height anomalies are contoured in light solid lines at 30 m intervals, and negative height anomalies are shown by light dashed lines. Areas of mean height anomalies greater than 30 m above normal have heavy shading, and areas of mean height anomalies of more than 30 m below normal have light shading.

Also, the charts show the seasonal mean sea level pressure (SLP) at 4 hPa intervals in heavy solid lines, labeled in hPa at selected intervals. Anomalies of SLP are contoured in light lines at 2 hPa intervals, with dark shading and solid lines in areas more than 2 hPa above normal, and light shading with dashed lines in areas greater than 2 hPa below normal.

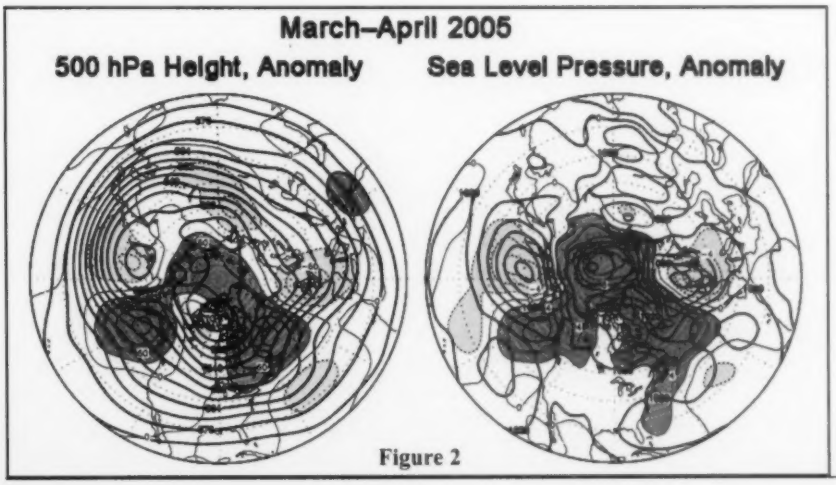


Figure 2

JANUARY-FEBRUARY 2005

The circulation pattern over the Northern Hemisphere during January and February was characterized by strong high latitude blocking, as reflected in an extensive area of above normal 500 hPa height with positive anomaly centers located over southern Greenland and over the Arctic Ocean on the Siberian side of the Pole. At the surface this was manifested in high pressure of more than 8 hPa above normal centered over the Arctic Ocean under the mid-tropospheric anomaly, with a connecting area of higher than normal surface pressure extending southward from the Arctic to the Great Lakes area. Deeper than normal troughs aloft, above strong mean low pressure areas at the surface, were located over the middle latitudes of the central Pacific and over the western Atlantic just to the south of the Canadian Maritimes. A relatively intense mid-tropospheric trough and lower than normal surface pressure were also located over eastern Europe and western Russia. This type of pattern is described as having strongly negative phases of both the Arctic Oscillation (AO) and North Atlantic Oscillation (NAO).

As is typical when this type of pattern occurs during the winter, there were extensive areas of below normal temperature over the northeastern United States and Europe, with cyclonic activity concentrated mainly in the areas of below normal SLP over the central Pacific and the western Atlantic. The Atlantic cyclonic center was strongest in January and the Pacific one was the most intense in

February. The abnormally cold weather was especially noteworthy over New England during January, continuing a pronounced cold spell that began during December. The mildest weather relative to normal was located over the southern Great Plains in January, as hinted by the slightly enhanced southerly component in the anomalous geostrophic wind implied by the 500 hPa height anomaly field (***Figure 1***), although in February the coldest conditions relative to normal were found across the southern tier of states from southern California to Georgia and the Carolinas. Temperatures averaged slightly above normal across the northern border states from Washington to Minnesota during February, while a strong reversal in temperature anomalies occurred over Alaska, going from well below normal during January to as much as 10F above normal in the eastern interior of the state during February.

Offshore anomalous surface flow over much of the Atlantic Seaboard was associated with relatively dry conditions in both January and February, with a general lack of heavy snowstorms in spite of the cold weather. The Florida Peninsula and the southern Plains had heavier than normal precipitation totals in both months, as would appear reasonable in the light of the stronger than normal southerly component in the 500 hPa flow over the southwestern part of the country, and a somewhat enhanced subtropical jet stream in Feburary. However, the wet weather in Florida appears to have been primarily related to frequent showers in the return flow of Arctic air flowing southward off the Atlantic Coast and becoming unstable after being moistened and heated over the relatively warm waters of the Gulf Stream. During February, when the trough over the West was strongest, most locations both along the Pacific Coast and in the interior Southwest reported above average precipitation.

MARCH-APRIL 2005

During March and April, both the Canadian and Siberian lobes of the polar vortex became somewhat stronger than normal, although blocking continued over much of the Arctic Basin, Barents Sea and northeastern Atlantic. Both the Bermuda High and the eastern Pacific ridge became stronger than normal, and with Arctic air confined to higher latitudes, temperatures averaged well above normal over most of the United States during March, with a reversion to slightly below normal in the Gulf coast area from Texas to Florida during April. During March, when the eastern Pacific ridge was at its strongest and extended into the West, many record high temperatures for the month, and for so early in the season, were set over the Southwest, accompanied by very dry weather that caused an unusually rapid melting of the snowpack in the mountains and an early outbreak of wildfires.

Significant storms during March were confined mostly to the middle of the United States, where the moisture brought welcome relief to some areas with incipient drought conditions. In April, precipitation became more widespread over the Southwest and the Northeast, after both areas were unusually dry in March. Most of the Midwest became drier than normal during April. The variations in the climate during March and April were not all obvious from the map that averaged the two months (***Figure 2***), due to considerable variability during this period.

THE TROPICS

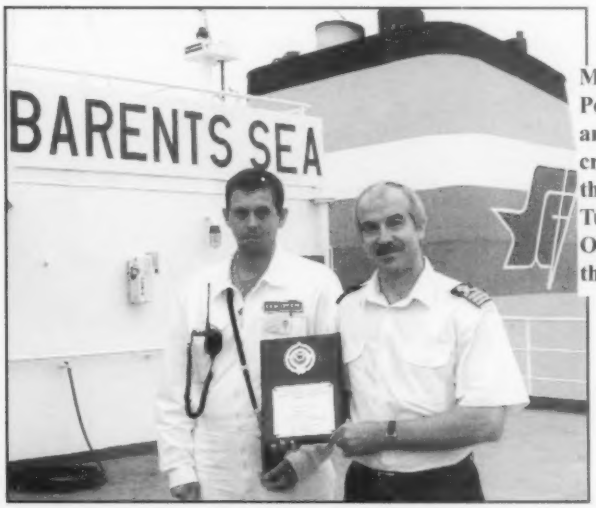
The first four months of 2005 featured a continuation of neutral ENSO conditions, with equatorial SSTs slightly below normal over the eastern Pacific and more noticeably above normal near and just west of the Dateline. Atmospheric indices that measure the status of ENSO averaged close to normal values. As is often the case with a near neutral ENSO, the Madden-Julian Oscillation (MJO) was fairly active over the eastern Indian and western Pacific Oceans. The MJO waves did not propagate strongly east of the Dateline due to the cooler than normal SSTs that were unable to support active convection. However, it is believed that MJO activity did modulate the circulation over the Pacific during much of the winter, contributing to reversals in the phase of the Pacific/North American Pattern (PNA) that caused significant intraseasonal variations in temperature and precipitation over the United States. The overall perception was that the climate was somewhat more variable than usual during the first four months of 2005.

There is good evidence that the first hurricane ever recorded in the South Atlantic Ocean occurred during March. Satellite visible imagery showed a well-defined eye, and wind gusts of up to 90 mph were observed near the location of landfall. The storm was named Catarina, after the Brazilian province where it made landfall.

VOS Program Awards

Accepting the second consecutive annual award for M/V *Horizon Producer* of Horizon Lines are Captain Don Cocozza (left), Captain Bill Boyce, (center), Chief Mate Chris Danilek (right). Not pictured are Second Mate Bob Anderson and Third Mate Mark Harris. The US VOS program congratulates them on a job well done!

Second Mate David Allen of the *Horizon Anchorage* received their 2004 VOS Award while in the Port of Anchorage on March 27, 2005. The *Horizon Anchorage* was the number one container ship in the Pacific for 2004 with 1,321 observations. They were the number one Horizon ship for 2004 (excluding the Horizon ship that had an automated observing system.) This is an all time new record for the *Horizon Anchorage* and is 57% higher than their 2003 total.



Master Yuri Lazorkin (on right) and Chief Officer Dmitry Petrov (on Left) of Unicom's M/T *Barents Sea* accepted an annual VOS Award for 2004 on behalf of the company and crew. The *Barents Sea* took almost 500 observations in less than 10 months. Not pictured are Second Officer Vladislav Turukin, Third Officer Sergy Komissarov and Third Officer Vladimir Lomanov. Thanks! Congratulations to the company and crew!! Keep up the great work!

Captain Gordon Gimball (left) and Chief Mate Mike Parr (center) accepted the 2004 VOS Award for outstanding performance on behalf of the crew of the *Horizon Hawaii* from New York PMO Jim Luciani (right.) The *Hawaii* of Horizon Lines continued their tradition of outstanding observation support (garnering their second consecutive award) by taking nearly 800 observations during 2004.

Photo courtesy of Cadet Tom Hamilton.

The *Horizon Discovery* received a 2004 VOS Award. Pictured left to right receiving the award are Third Mate John Sullivan, Chief Mate Dan Corn, and Captain John Hess.

Captain Peter A. Sarandinaki (on left) and Captain John F. Kihm (on right) received a 2003 VOS Award for the *Horizon Crusader.*

A 2004 VOS Award was presented to the *Horizon Crusader*. Pictured Left to right receiving the award are Third Mate Richard Erbe, Chief Mate Don Josberger, Third Mate George Hight, Captain John Kihm, and Captain Peter A. Sarandinaki.

The *Sealand Motivator* received their third consecutive VOS Award for 2004. Captain John Finney (right) and Second Mate Geoff Bird (left) are shown receiving this award. The crew of the *Sealand Motivator* provided over 800 quality marine weather observations in 2004, in addition to taking upper air observations. The National Weather Service and NOAA thank both Masters and Mates on the *Sealand Motivator*.

The *Maersk Carolina* received a VOS Award for outstanding performance. Receiving the award is, left to right, Chief Mate Eric Axelsson, Captain John Petronio, and Second Mate Chris Weigler.

Pictured on the left is Captain Bob Ramsey and on the right is Chief Mate Brad Goodwin of the *Horizon Tacoma*. They received the 2004 VOS Award while in the Port of Anchorage on April 3, 2005. This ship took 625 weather observations for the year 2004.

The *Duncan Island* received a 2004 VOS Award. Pictured left to right are Third Officer Ariel Cabezas, Chief Officer Stanko Zloic, and Second Officer Nikola Matic.

Captain Michael Leveille of E-Ships *Enterprise* proudly accepted the 2004 VOS Outstanding Performer Award on behalf of the company and crew. This is the second consecutive award for *Enterprise*, who took over 600 weather observations in 2004. The ship is also an active participant in AOML XBT program. Congratulations.

The *Barrington Island* received a 2004 VOS Award. From left to right are GPD2 Al Maquiling, Second Officer Ricardo Pajunar, Master Zoran Juretic, and Chief Officer Dani Batica.

Capt Robert Strobel and Capt John Farmer of the *Lykes Navigator* were presented the 2004 VOS Award for the second consecutive year. The *Lykes Navigator* provided 1081 quality marine observations, an increase of 300 observations from the previous year. Not pictured is 2nd Mate Tom Lewis who provided significant contributions to the success of the program.

The NOAA Ship *Gordon Gunter* received a VOS Award.Pictured left to right, ENS Jonathan Taylor, CO CDR Jim Meigs, XO LT Mike Ellis, ENS Tony Perry III, and centered, Second Mate Miri Skoriak.

Chris Fakes, Houston PMO (center) presented the 6th consecutive annual VOS Award to the *Lykes Discoverer*. Accepting the award on the behalf of the crew is Captain Scott Putty (left) and Chief Mate Mary Beth O'Brien (right). In 2004 the *Lykes Discoverer* provided 1095 marine observations. The National Weather Service and NOAA extend their "Thanks" for the consistent support provided by the masters and mates of the *Lykes Discoverer*.

Once again, for the seventh consecutive year, the annual VOS Award was presented to the *Sealand Integrity*. In 2004 the *Sealand Integrity* provided over 2,500 quality marine observations, nearly 1,000 more than in 2003. Consistency in reporting is extremely important to the Marine Forecast Models. The Masters and Mates on the *Sealand Integrity* had a tremendous impact on the quality of forecasts and warnings. The National Weather Service and NOAA extends their "Thanks" for the consistent quality support provided by the Masters and Mates of the *Sealand Integrity*. Pictured left to right are Third Mate Matthew Parker, PMO Chris Fakes, Captain Mike Rausa, Chief Engineer Bill Hall, Second Mate Darren Collins, and Chief Mate Karen Reyes. Not pictured but contributing to the *Sealand Integrity's* success in 2004 are Captain Wes Winters, Captain Alan Hinshaw, and Chief Mate Bruce Myrdek.

A "Special Thanks" is given to Captain Wes Winters for the many yeas he supported the VOS program. His efforts helped marine forecasters worldwide in providing timely warnings and forecasts. Captain Winters recently retired and is "Gone Fishing." He will be missed by all. Fair Winds and Following Seas Captain Winters.

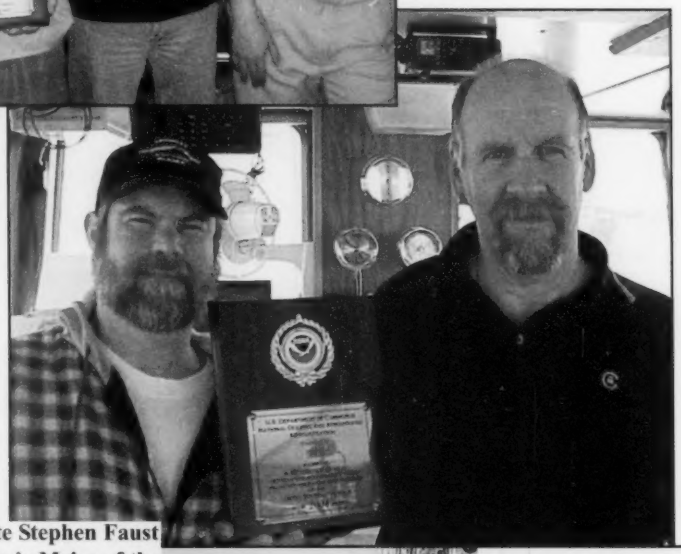
Pictured left to right, First Officer Glen Mollan, Weatherlab Director Liz Williams, and Master Ole-johan Gronhaug receiving a VOS Award for the *Explorer of the Seas.*

Pictured left to right are Master Tom Desjardins, Third Mate Matt Michalski, Chief Mate Ian Lawrence, and Second Mate Dave Kramer receiving a VOS Award for the *Roger Revelle.*

The *Liberty Star* received a 2004 VOS Award. Pictured left to right are Port Engineer for Liberty Maritime Corporation Jerry Curtis, Second Mate Lawrence Wolff, PMO New Orleans Paula Campbell, Capt Rick Danahy, Third Mate James Passeretti, and Chief Mate Gerard Dundon. Thanks to all the MEBA mates who contributed to weather reporting aboard the M/V *Liberty Star.*

LCDR Phillip A. Gruccio (right) and First Officer Stephen P. Wagner (left) accepted a 2004 VOS Award for the NOAA Ship *Delaware II*. This ship took over 950 weather observations during 2004. Congratulations on a job well done!

The M/V *Selma Kalkavan* received a VOS Award. Pictured left to right are relief Chief Mate Ahmet Efe, Chief Mate Gultekin Ergunay, Second Mate Ozan Koseoglu, Captain Hayri Afkan, and Third Mate Barbaros Kalkavan.

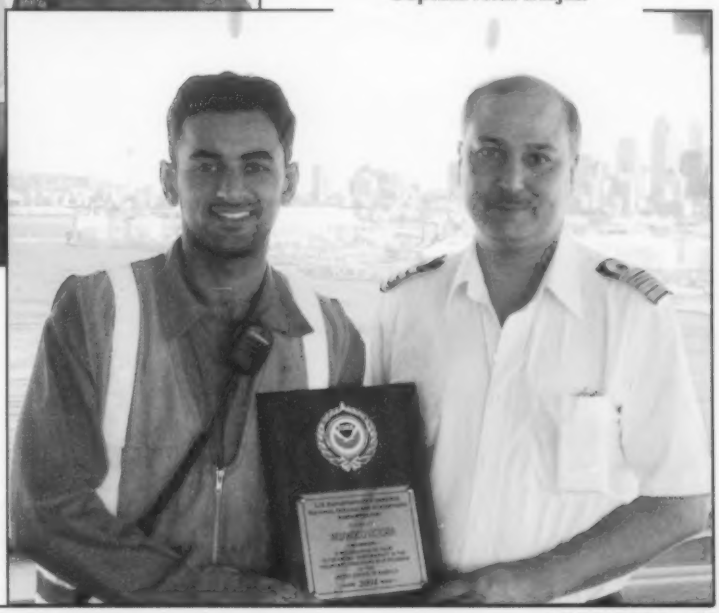


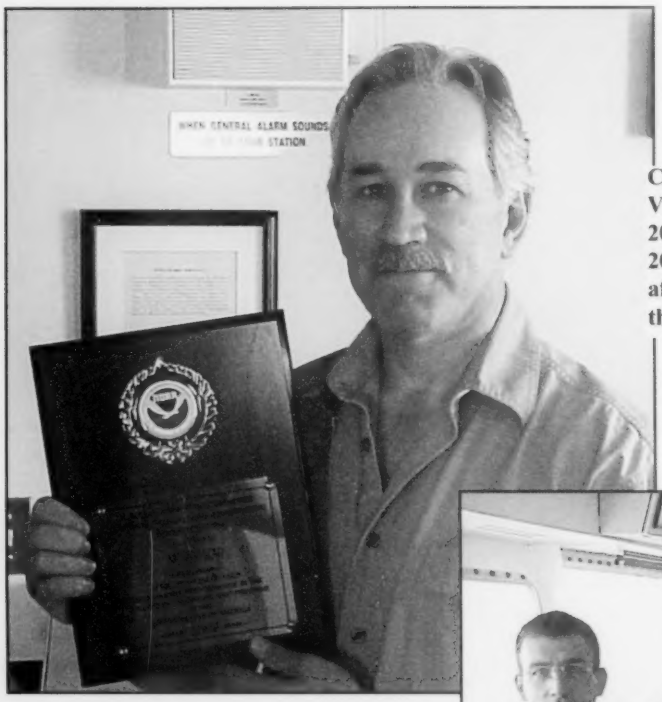
Pictured on the left is Chief Mate Stephen Faust and on the right is Captain Bernie Meier of the Crowley Tug *Sinuk*. They received their third consecutive VOS award while in the Port of Anchorage, Alaska on May 17, 2005. The crew of the *Sinuk* took 1,016 weather observations in 2004 while operating in the Alaskan waters.

The crew of the *Lykes Liberator* received their second consecutive VOS Award for outstanding performance in Marine Observations for 2004. They provided over 1120 observations in 2004, which more than doubled their 2003 performance. The crew has not slowed down in 2005, already providing over 860 observations through May. The National Weather Service and NOAA extends their special thanks to the Masters and Mates of the *Lykes Liberator* for their continuing outstanding support. Pictured left to right (front) C.E. Bonilla, AB; M.R. White, O.S.; A. Brown, Dk Util; N. Dandapani, Dk Cadet; (back) Captain D.A. Sulin; H. Brown, AB; Chief Mate S.T. NcNeice (holding plaque); Second Mate R.F. Warren; Third Mate B.R. Hager. Also deserving mention for their help over the past year is Chief Mate D.J. Martin, Chief Mate R. Beauregard, Second Mate J.M. Cox, Third Mate K.P. Corrigan, Third Mate T.M. Battles, Second Mate D. Duzich, Chief Mate A.D. Rodriguez, and Third Mate J.M. Burnett.

The *Westwood Victoria* was given a 2004 VOS award for their dedicated service. Pictured left to right are Third Mate Himanshu Kaushal and Captain Atul Baijal.

The *Westwood Marianne* captured a 2004 VOS Award for their valuable weather observations while crossing the Pacific Ocean. Pictured left to right are Captain Ronelo Ledesma, Chief Mate Rodolfo Robles, and Third Mate Louie Peter Amedo.





Captain Jack Hearn of the *North Star* received the 2004 VOS award while in the Port of Anchorage on June 7, 2005. The *North Star* took 979 weather observations in 2004, which was their first full year in the VOS program after being commissioned in 2003. The *North Star* had the most observations of any ship in the Tote fleet.

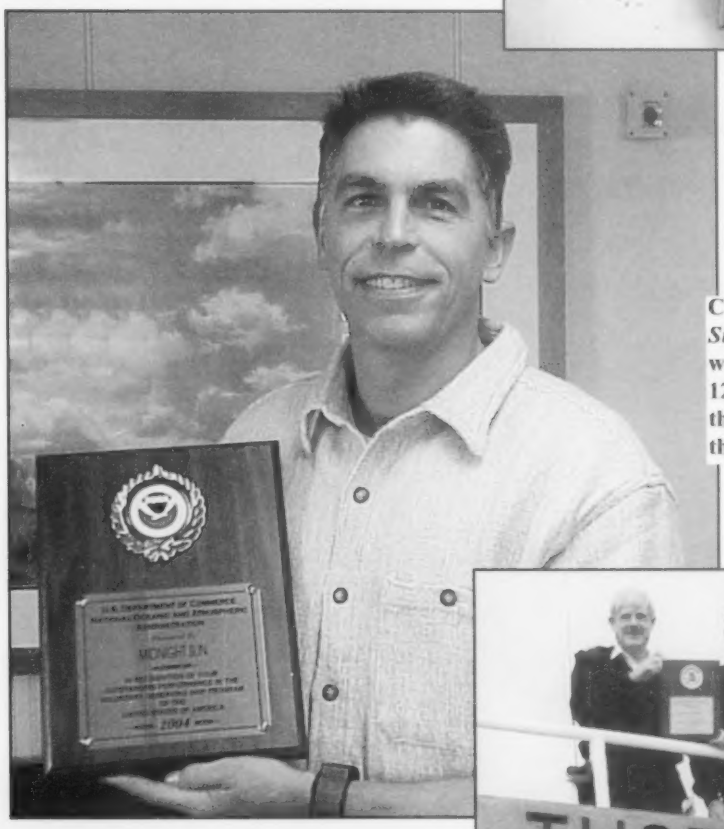
The LNG *Polar Eagle* received a 2004 VOS Award while at Nikiski, Alaska on May 27, 2005. The *Polar Eagle* set a new all time record for the most marine observations in one year with 2,232. This was 31.8% more than they took in 2003. Pictured left to right, receiving the award, are: Second Mate Carmelo Bagnato, Chief Mate Luigi Colelli, Captain Gaetano D'Agostino, and Second Mate Francesco Caccamo.

Crowley Marine Services is one of the top supporters of the National Weather Service in Alaska. In 2004, the tug *Seneca* set a new all time Crowley record with 1,219 weather observations. The top 6 Crowley tugs for 2004 and their number of observations taken are:

1.	Senneca	1,219
2.	Sinuk	1,016
3.	Sioux	695
4.	Sea Prince	487
5.	Guardsman	421
6.	Navigator	300

This photo was taken at the Crowley office in Anchorage, Alaska on June 14, 2005. Due to scheduling issues, the tug *Senneca* and the tug *Sioux* were unavailable for a ship board photo, so the VOS Award presentation was made at the Crowley office.

Pictured are Paul Dornfeld (left) and Charles Parish (right), both captains of the the *Seabulk Montana*. They received their 2004 VOS Award while at the Port of Anchorage on June 14, 2005. The *Seabulk Montana* took 1,321 weather observations in 2004, which placed them among the top 7 vessels in the National Weather Service Voluntary Observing Ship Program. In addition, the crew provided valuable ice observations, ice conditions, photographs, and sea water temperature observations from Cook inlet, Alaska. This was their 4th consecutive year to win the prestigious VOS Award. The *Seabulk Montana* has a home port of Nikiski, Alaska and is under contract to Cook Inlet Spill Prevention & Response, Inc.



Captain Ron La Barre of the *Midnight Sun* received the 2004 VOS award while in the Port of Anchorage on June 12, 2005. The *Midnight Sun* received their first VOS Award while having their best year with 801 observations.

The Alaska Marine Highway Ferry *Tustumena* received a 2003 VOS Award. Pictured left to right are Captain Bob Ruger, Chief Mate Scott Merrill, and Second Mate John Maher.

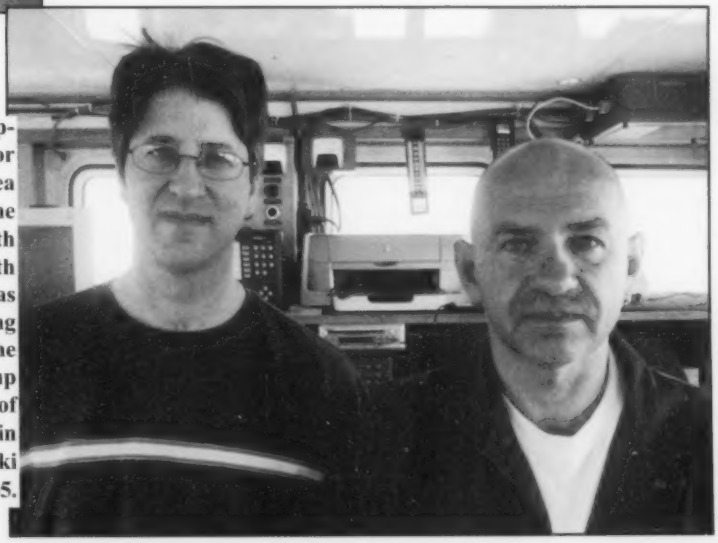
Pictured left to right are Chief Mate Paul Savasuk and Third Mate John P. Rawley as they receive the 2004 VOS Award for the *Horizon Challenger*.

Pictured on the left, PMO Jack Warrelman presents the 2004 VOS Award for the *El Junque* to Captain Lou Hartman, center, and Third Mate John McParland, left.

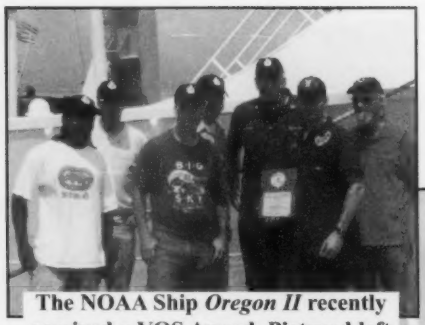
Pictured left to right are Second Mate Ted Duke, Captain James Balano, and Third Mate George Leonov as they receive the 2002 VOS Award for the *Overseas Joyce*. Not pictured is Chief Mate Matt Pouliot.

Pictured left to right are: Chief Mate Ciro Lrenzano, Captain Maruo Bianco, and Second Mate Luigi Staiano of the *Arctic Sun* receiving their 2004 VOS Award while at Nikiski, Alaska on June 10, 2005. The *Arctic Sun* set a new all time record for their most observations in one year with 2,151. This was 22.3% more than they took in 2003.

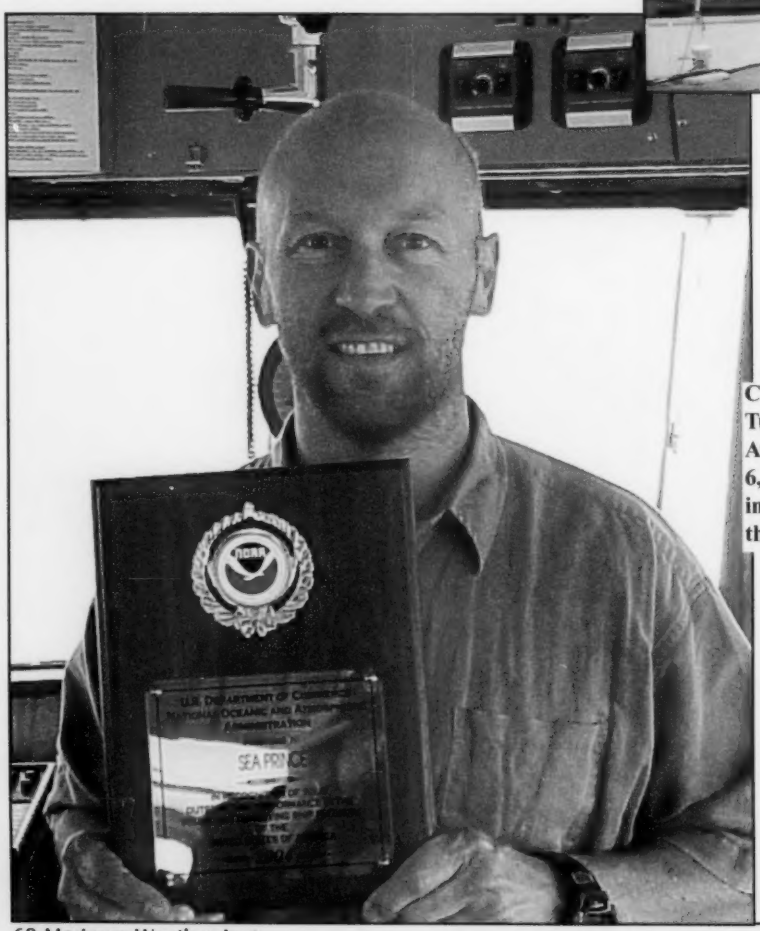
Accepting the VOS Award for the NOAA Ship *Albatross IV* are ENS Dan Orr (left) and ENS Patrick Murphy (right.)



Sea Coast Towing has become one of the top supporters of the VOS Program in Alaskan waters. For the period January 1 through June 30, 2005, Sea Coast had 2 tugs among the top 10 vessels in the entire VOS Program. *Pacific Raven* is ranked 7th with 825 observations, and *Pacific Challenger* is 8th with 789 observations. The *Pacific Challenger* was ranked 1st in the VOS Program for 2004 among non-automated vessels with 2,603 observations. The *Pacific Raven* had 113 for 2004, but has jumped up to 825 observations for 2005 in just 6 months of time. Pictured on the left is *Pacific Raven* Captain Pete Pawlicki along with Chief Mate Jacek Sidorski while at the Port of Anchorage on July 12, 2005.



The NOAA Ship *Oregon II* recently received a VOS Award. Pictured left to right (front row) Leonard White, Tim Burrell, and ENS Paul Hemmick, (back row) Robert Coleman, ENS Collin Little, LT Jeremy Adams, and Jim Rowe.



Captain Stephen Lundgren of the Crowley Tug *Sea Prince* received their 2004 VOS Award while in the Port of Anchorage on July 6, 2005. The *Sea Prince* took 487 observations in 2004, which was their most ever. This was the first VOS Award for the *Sea Prince*.

The vessel *Sealand Pride* was presented the 2004 VOS award for the second consecutive year. In 2004 the *Sealand Pride* provided over 820 quality marine observations, an increase of 170 observations from the previous year. Pictured left to right are Second Mate Al Albertelli, Chief Mate Bill Skye, Captain Pete Mitchell, and Third Mate Joe Tate. Not pictured but deserving recognition is Captain Brennan.

The Bernardo Quintana A received a VOS award. Pictured left to right, receiving the award, are Captain Allwyn Phillips, Chief Officer Chandra Sekhar Guddati, Addl Second Officer Siddarth V. Kadan, and Second Officer Eldon J. Baptist.

Mr. Hans J. Fangmeyer, Senior Fleet Manager (left) and Mr. Ole Raatz, Operations Manager (right), of *Alpha Ship* GMBH accepted an award in March 2005, from the NOAA/AOML Global Ocean Observing Systems Center recognizing *Alpha Ship* for their outstanding support of scientific sampling from their Voluntary Observing Ship Fleet. The award was presented by Mr. Steven K. Cook, Chairman—Ship of Opportunity Implementation Panel.

National Weather Service VOS Program New Recruits From March 1, 2005 through June 30, 2005

Name of Ship	Call	Agent Name	Recruiting PMO
ALASKAN EXPLORER	WDB9918	ALASKAN EXPLORER C/O ALASKA TANKER CO.	VALDEZ, AK
ARCTIC WANDERER	WCZ8910	ARCTIC WANDERER C/O NWS	KODIAK, AK
CARNIVAL MIRACLE	H3VS	FILLETTE GREEN	MIAMI, FL
CHEROKEE BRIDGE	V7FW7	TF MARINE INC, AL BERTONE	NEW YORK CITY, NY
DAVID FOSS	WYQ8110	TUG DAVID FOSS C/O FOSS MARITIME CO.	KODIAK, AK
EVER URSULA	3FCB9		SEATTLE, WA
EVER UTILE	3FZA9		SEATTLE, WA
FIDALGO	WUR9616	FIDALGO C/O SEA COAST TOWING	KODIAK, AK
FRANCONIA	3FWI7	WILMINGTON SHIPPING CO	CHARLESTON, SC
HANJIN OTTAWA	DANM	HANJIN OTTAWA C/O COSCO	ANCHORAGE, AK
HANSA COMMODORE	ELVE5	KERR NORTON STRACHAN, DESMOND MICHAEL	NEW YORK CITY, NY
HERCULES	WBN2074	HERCULES C/O CROWLEY MARITIME	ANCHORAGE, AK
HOEGH NEW YORK	LAEI6	TF MARINE, ATTN: AL BERTONE	NEW YORK CITY, NY
HOWARD OLSEN	WDB7214	HOWARD OLSEN C/O FOSS MARITMINE CO.	KODIAK, AK
HUAL SEOUL	LADO6	HUAL NORTH AMERICA, C/O JOHN GOLDSMITH	NEW YORK CITY, NY
INDAMEX COLORADO	P3PZ7		NEW YORK CITY, NY
INDEPENDENCE	WRJG	INDEPENDENCE C/O NWS	KODIAK, AK
IRENES REMEDY	SYAQ	EVERGREEN AMERICA CORP	NEW YORK CITY, NY
JOHN N. COBB	WMVC	NOAA SHIP JOHN N. COBB	ANCHORAGE, AK
JUTUL	LAVX5	M/V JUTIL C/O ALASKA MARITIME AGENCY	ANCHORAGE, AK
LT USODIMARE	IBPO		SEATTLE, WA
LYKES ACHIEVER	ZCDJ2	LYKES LINES LIMITED LLC	NEW ORLEANS, LA
MAERSK ARKANSAS	WDB9984	MAERSK LINE LTD	BALTIMORE, MD
MAERSK DARMSTADT	9HYN7	KERR NORTON STRACHAN AGENCY	NEW YORK CITY, NY
MAERSK RIMINI	C6TR2	ANGLO-EASTERN SHIP MANAGEMENT LTD.	NEW YORK CITY, NY
MAERSK TEAL	S6HK	WALLENIUS LINES N. A. INC	CHARLESTON, SC
MAERSK TIDE	9VEC	A.P. MOLLER SINGAPORE LTD	BALTIMORE, MD
MANULANI	WDC4696	MATSON NAVIGATION CO.	NEW YORK CITY, NY
MERKUR	PJTA	KERR NORTON STRACHAN	NEW YORK CITY, NY
MOL INGENUITY	3EMH9	KERR NORTON STRACHAN	NEW YORK CITY, NY
MSC DIEGO	3FZP8	MSC (USA) INC.	NEW YORK CITY, NY
MSC MAEVA	HPTF	NEW ASIAN SHIPPING CO. LTD	CHARLESTON, SC
NORASIA ANDES	A8FA4		NEW YORK CITY, NY
NORASIA SILS	HBDF	ATG NEW YORK (CSAV), ATTN: RUBY SIDHWA	NEW YORK CITY, NY
NUKA ISLAND	WAR2130	NUKA ISLAND	KODIAK, AK
OOCL ATLANTA	VRAR6	OOCL ATLANTA C/O OOCL USA INC	ANCHORAGE, AK
ORANGE SKY	ELZU2	BIEHL & CO, CRAIG SMITHLINE	NEW YORK CITY, NY
POWHATAN	WCZ5243	POWATAN C/O SAUSE BROS OCEAN TOWING CO	KODIAK, AK
PROGRESS ACE	HPQI	KERR NORTON STRACHAN	NEW YORK CITY, NY
SEA BARB	WYX3430	SEA BARB	KODIAK, AK
SEA-LAND VALUE	9VEM	MAERSK LINE AGENCY	CHARLESTON, SC
STELLAR SEA	KGCJ	STELLAR SEA C/O NWS KODIAK	KODIAK, AK
SUMIDA	3FMX7	TF MARINE INC	NEW YORK CITY, NY
VINCENT THOMAS BRIDGE		H3WJ	SEATTLE, WA

44 More Outstanding Recruits
Welcome Aboard!—Luke

VOS Cooperative Ship Report: January through December 2005

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2ND LT JOHN P. BOBO	WJKH	Norfolk	47	60	36	0	0	0	0	0	0	0	0	0	143
ADMIRALTY WIND	WCY7687	Anchorage	0	7	5	0	0	0	0	0	0	0	0	0	12
ADVANTAGE	WPPO	Norfolk	46	25	34	15	25	7	0	0	0	0	0	0	152
ALASKAN EXPLORER	WDB9918	Valdez	0	0	0	16	8	11	0	0	0	0	0	0	35
ALASKAN FRONTIER	WDB7815	Valdez	0	0	0	0	0	6	0	0	0	0	0	0	6
ALASKAN LEADER	WDB7918	Kodiak	96	6	62	0	0	0	0	0	0	0	0	0	164
ALBATROSS IV	WMVF	Norfolk	45	101	105	117	119	46	0	0	0	0	0	0	533
ALBEMARLE ISLAND	C6LU3	Miami	11	20	18	30	39	40	0	0	0	0	0	0	158
ALERT	WCZ7335	Valdez	7	1	2	6	3	4	0	0	0	0	0	0	23
ALKIN KALKAVAN	V7GY3	Norfolk	0	0	0	0	0	22	0	0	0	0	0	0	22
ALTAIR VOYAGER	C6OK	Baltimore	10	11	49	56	39	51	0	0	0	0	0	0	216
AMERICAN NO. 1	WTY8664	Kodiak	0	0	1	0	0	0	0	0	0	0	0	0	1
AMSTERDAM	PBAD	Anchorage	21	29	23	32	25	4	0	0	0	0	0	0	134
ANTARES VOYAGER	C6PZ3	San Francisco	9	19	24	42	9	5	0	0	0	0	0	0	108
APL ALMANDINE	9VBS	Norfolk	0	0	14	3	0	0	0	0	0	0	0	0	17
APL AMAZONITE	9VBX	Los Angeles	17	54	30	60	45	46	0	0	0	0	0	0	252
APL AUSTRALIA	A8FS8	New York City	21	26	26	25	20	26	0	0	0	0	0	0	144
APL CANADA	A8CG6	San Francisco	0	0	50	24	49	31	0	0	0	0	0	0	154
APL CHINA	WDB3161	Los Angeles	70	56	49	59	63	41	0	0	0	0	0	0	338
APL DALIAN	S6HU6	Norfolk	8	43	40	32	25	5	0	0	0	0	0	0	153
APL JADE	9VVD	New York City	0	0	0	0	0	16	0	0	0	0	0	0	16
APL JAPAN	S6TS	Seattle	61	76	28	33	66	88	0	0	0	0	0	0	352
APL KENNEDY	9VAY4	Seattle	70	54	59	63	38	36	0	0	0	0	0	0	320
APL KOREA	WCX8883	Los Angeles	23	13	0	3	22	21	0	0	0	0	0	0	82
APL PHILIPPINES	WCX8884	Los Angeles	8	31	48	35	19	12	0	0	0	0	0	0	153
APL SCOTLAND	9VDD3	Seattle	0	0	22	0	0	0	0	0	0	0	0	0	22
APL SINGAPORE	WCX8812	Los Angeles	46	37	0	37	49	41	0	0	0	0	0	0	210
APL SWEDEN	9VYY5	Seattle	28	33	65	53	66	35	0	0	0	0	0	0	280
APL THAILAND	WCX8882	Los Angeles	64	24	3	37	42	44	0	0	0	0	0	0	214
APL TURQUOISE	9VVY	San Francisco	19	25	14	5	19	22	0	0	0	0	0	0	104
ARAL SEA	S6CD2	Houston	0	51	49	68	65	60	0	0	0	0	0	0	293
ARCTIC BEAR	WBP3396	Kodiak	0	0	0	1	0	0	0	0	0	0	0	0	1
ARCTIC SUN	ELQB8	Anchorage	219	254	192	183	98	158	0	0	0	0	0	0	1104
ARCTIC WANDERER	WCZ8910	Kodiak	0	0	0	0	0	8	0	0	0	0	0	0	8
ARIZONA VOYAGER	KGBE	Miami	11	30	22	0	0	4	0	0	0	0	0	0	67
ARTHUR M. ANDERSON	WE4805	Chicago	0	0	2	45	51	25	0	0	0	0	0	0	123
ASPHALT COMMANDER	WFJN	New Orleans	34	5	27	0	0	1	0	0	0	0	0	0	67
ATLANTIC CARTIER	SCKB	Norfolk	0	0	0	0	0	37	0	0	0	0	0	0	37
ATLANTIC FOREST	WDB2122	New Orleans	5	0	34	26	2	10	0	0	0	0	0	0	77
ATLANTIC OCEAN	C6T2064	New York City	26	48	47	20	46	16	0	0	0	0	0	0	203
ATLANTIS	KAQP	Kodiak	0	0	6	8	9	9	0	0	0	0	0	0	32
ATTENTIVE	WCZ7337	Valdez	33	17	8	0	1	6	0	0	0	0	0	0	65
AURORA	WYM9567	Kodiak	0	0	0	0	1	0	0	0	0	0	0	0	1
AWARE	WCZ7336	Valdez	18	21	14	2	6	4	0	0	0	0	0	0	65
BARENTS SEA	9VAP5	New York City	32	36	51	34	7	0	0	0	0	0	0	0	160

VOS Cooperative Ship Report

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
BARRINGTON ISLAND	C6QK	Miami	58	45	65	42	25	57	0	0	0	0	0	0	292
BARROW RESEARCH	KCB53	Anchorage	0	0	0	27	32	26	0	0	0	0	0	0	85
BENGAL SEA	ELPL3	New York City	0	0	0	2	0	0	0	0	0	0	0	0	2
BERNARDO QUINTANA A	C6KJ5	New Orleans	64	23	40	24	26	47	0	0	0	0	0	0	224
BESIRE KALKAVAN	V7GY4	Norfolk	0	0	0	42	31	29	0	0	0	0	0	0	102
BILLIE H.	WCY4992	Kodiak	2	0	0	0	0	0	0	0	0	0	0	0	2
BLUEFIN	WQZ9646	Kodiak	0	9	0	0	0	0	0	0	0	0	0	0	9
BOUCHARD BOYS	WCY7761	Kodiak	2	0	0	2	0	1	0	0	0	0	0	0	5
BOWFIN	WSX7318	Kodiak	0	2	6	0	0	0	0	0	0	0	0	0	8
BREEZE ARROW	LAOT4	Seattle	44	10	0	45	26	39	0	0	0	0	0	0	164
BRUCE	WWU8	Anchorage	28	27	30	26	25	17	0	0	0	0	0	0	153
BUCCANEER	WYW5588	Kodiak	0	0	4	0	0	4	0	0	0	0	0	0	8
BULWARK	WBN4113	Valdez	13	7	0	6	0	1	0	0	0	0	0	0	27
BURNS HARBOR	WDB4745	Chicago	5	0	4	18	28	6	0	0	0	0	0	0	61
CAJUN EXPRESS	ELXL3	Houston	8	79	17	42	57	49	0	0	0	0	0	0	252
CAMAI	KF003	Kodiak	0	0	0	2	0	1	0	0	0	0	0	0	3
CANMAR DYNASTY	VSXC4	Anchorage	1	2	4	16	15	0	0	0	0	0	0	0	38
CANMAR PROMISE	ELXZ9	Anchorage	100	39	0	0	0	0	0	0	0	0	0	0	139
CAP DOUKATO	A8EW3	Charleston	13	0	10	0	0	0	0	0	0	0	0	0	23
CAPE VINCENT	KAES	Houston	0	0	27	31	0	0	0	0	0	0	0	0	58
CAPT STEVEN L BENNETT	KAXO	New Orleans	6	7	0	0	4	5	0	0	0	0	0	0	22
CARNIVAL CONQUEST	3FPQ9	New Orleans	5	9	14	2	0	17	0	0	0	0	0	0	47
CARNIVAL DESTINY	C6FN4	Miami	7	4	6	2	1	14	0	0	0	0	0	0	34
CARNIVAL GLORY	3FPS9	Jacksonville	7	0	12	32	40	39	0	0	0	0	0	0	130
CARNIVAL HOLIDAY	C6FM6	New Orleans	2	7	5	0	0	12	0	0	0	0	0	0	26
CARNIVAL PRIDE	H3VU	Miami	4	0	1	2	6	1	0	0	0	0	0	0	14
CARNIVAL SENSATION	C6FM8	Miami	31	19	25	26	29	22	0	0	0	0	0	0	152
CARNIVAL SENSATION	C6FM8	New Orleans	31	19	25	26	29	22	0	0	0	0	0	0	152
CARNIVAL TRIUMPH	C6FN5	Miami	21	8	8	11	4	12	0	0	0	0	0	0	64
CARNIVAL VALOR	H3VR	Miami	0	0	0	0	0	23	0	0	0	0	0	0	23
CARNIVAL VICTORY	3FFL8	Miami	20	11	34	35	31	32	0	0	0	0	0	0	163
CARSTEN MAERSK	OZYB2	Seattle	16	25	0	0	0	0	0	0	0	0	0	0	41
CASON J. CALLAWAY	WE4879	Chicago	21	0	17	56	49	50	0	0	0	0	0	0	193
CELEBRATION	H3GQ	Jacksonville	15	0	14	0	14	5	0	0	0	0	0	0	48
CELTIC SEA	C6RT	Miami	0	0	0	22	18	20	0	0	0	0	0	0	60
CENTURY	C6FU5	Miami	12	14	15	8	5	0	0	0	0	0	0	0	54
CENTURY HIGHWAY #2	3EJB9	Los Angeles	18	15	20	0	0	0	0	0	0	0	0	0	53
CHANG JIANG BRIDGE	3EZJ9	Seattle	58	55	72	55	19	43	0	0	0	0	0	0	302
CHARLES ISLAND	C6JT	Miami	59	64	60	63	57	21	0	0	0	0	0	0	324
CHARLES M. BEEGHLEY	WL3108	Chicago	13	0	4	13	6	13	0	0	0	0	0	0	49
CHARLESTON	WBVY	Houston	0	5	10	8	10	1	0	0	0	0	0	0	34
CHEMICAL EXPLORER	KRGC	Houston	0	1	18	7	34	10	0	0	0	0	0	0	70
CHEMICAL TRADER	KRGJ	Houston	3	12	21	11	6	5	0	0	0	0	0	0	58
CHEROKEE BRIDGE	V7FW7	New York City	0	0	0	24	67	43	0	0	0	0	0	0	134
CHESAPEAKE BAY	WMLH	Norfolk	46	51	29	22	54	30	0	0	0	0	0	0	232
CHESAPEAKE BAY BRIDGE	V7FW8	New York City	0	0	0	0	18	24	0	0	0	0	0	0	42
CLEVELAND	KGXA	Houston	48	29	16	62	47	40	0	0	0	0	0	0	242
COASTAL MERCHANT	WCV8696	Seattle	0	0	0	1	3	0	0	0	0	0	0	0	4

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
COASTAL NAVIGATOR	WCY9686	Seattle	0	5	2	0	0	0	0	0	0	0	0	0	7
COASTAL PILOT	WBP7281	Kodiak	1	3	0	0	0	0	0	0	0	0	0	0	4
COASTAL RELIANCE	WADZ	Kodiak	47	97	66	85	70	61	0	0	0	0	0	0	426
COLD BAY RESEARCH	KCI95	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
COLLIER BROTHERS	WUU7551	Kodiak	2	1	0	0	0	0	0	0	0	0	0	0	3
COLORADO VOYAGER	KLHZ	San Francisco	1	2	0	0	7	5	0	0	0	0	0	0	15
COLUMBINE MAERSK	OUHC2	Seattle	0	52	0	22	17	0	0	0	0	0	0	0	91
COLUMBUS VICTORIA	P3RF8	Norfolk	21	18	19	9	21	23	0	0	0	0	0	0	111
CONDOR	PJWQ	New York City	0	0	0	36	47	53	0	0	0	0	0	0	136
CORAL SEA	C6YW	Miami	21	25	32	14	0	0	0	0	0	0	0	0	92
CORNELIA MAERSK	OWWS2	Seattle	10	0	51	0	16	34	0	0	0	0	0	0	111
CORWITH CRAMER	WTF3319	Kodiak	5	0	2	56	7	3	0	0	0	0	0	0	73
COURTNEY L	ZCAQ8	Baltimore	28	33	15	17	29	22	0	0	0	0	0	0	144
CSL CABO	D5XH	Seattle	20	16	17	14	13	7	0	0	0	0	0	0	87
CYNTHIA FAGAN	KSDF	Houston	66	40	64	35	15	18	0	0	0	0	0	0	238
DAIO ANDES	3FDN9	Anchorage	60	86	79	84	93	44	0	0	0	0	0	0	446
DAVID FOSS	WYQ8110	Kodiak	0	0	0	0	15	55	0	0	0	0	0	0	70
DAVID STARR JORDAN	WTDK	Los Angeles	62	130	3	143	105	89	0	0	0	0	0	0	532
DEEPWATER HORIZON	V7HC9	Houston	136	129	154	96	158	187	0	0	0	0	0	0	860
DEEPWATER MILLENNIUM	V7HD2	Houston	31	37	37	27	7	30	0	0	0	0	0	0	169
DELAWARE BAY	WMLG	Norfolk	24	21	42	39	18	13	0	0	0	0	0	0	157
DELAWARE BRIDGE	V2OE2	New York City	49	28	16	64	11	48	0	0	0	0	0	0	216
DELAWARE II	KNBD	New York City	27	84	116	100	43	109	0	0	0	0	0	0	479
DELAWARE TRADER	WDB3258	Houston	0	0	0	0	38	68	0	0	0	0	0	0	106
DENALI	WSVR	Los Angeles	0	0	0	0	0	12	0	0	0	0	0	0	12
DEVELOPMENT DRILLER 1	YJSW5	Houston	0	0	0	0	25	12	0	0	0	0	0	0	37
DIANE H.	WUR7250	Kodiak	0	0	0	7	4	4	0	0	0	0	0	0	15
DIRCH MAERSK	OXQP2	Los Angeles	23	28	30	23	29	18	0	0	0	0	0	0	151
DIRECT JABIRU	A8CF4	Anchorage	44	68	62	55	89	56	0	0	0	0	0	0	374
DISCOVERER DEEP SEAS	V7HC6	New Orleans	0	45	42	30	38	41	0	0	0	0	0	0	196
DISCOVERER ENTERPRISE	V7HD3	New Orleans	1	0	3	3	20	6	0	0	0	0	0	0	33
DISCOVERER SPIRIT	V7HC8	Houston	27	19	39	33	19	12	0	0	0	0	0	0	149
DREW FOSS	WYL5718	Kodiak	1	24	1	7	1	0	0	0	0	0	0	0	34
DUNCAN ISLAND	C6JS	Miami	53	43	61	48	53	49	0	0	0	0	0	0	307
ECSTASY	H3GR	Miami	12	6	11	10	12	11	0	0	0	0	0	0	62
EDGAR B. SPEER	WQZ9670	Chicago	0	0	0	0	0	4	0	0	0	0	0	0	4
EDYTH L	C6YC	Baltimore	38	34	26	29	56	64	0	0	0	0	0	0	247
EL MORRO	KCGH	Jacksonville	24	25	12	31	28	30	0	0	0	0	0	0	150
EL YUNQUE	WGJT	Jacksonville	44	23	35	62	65	37	0	0	0	0	0	0	266
ELATION	3FOC5	Miami	34	33	57	30	44	45	0	0	0	0	0	0	243
EMMA FOSS	WCF3931	Kodiak	0	0	0	0	7	121	0	0	0	0	0	0	128
EMPIRE STATE	KKFW	New York City	0	0	0	0	14	29	0	0	0	0	0	0	43
ENDEAVOR	WAUW	New York City	33	27	32	39	37	16	0	0	0	0	0	0	184
ENDURANCE	WAUU	New York City	25	34	39	76	65	76	0	0	0	0	0	0	315
ENDURANCE	WDA3359	Valdez	25	34	39	76	65	76	0	0	0	0	0	0	315
ENTERPRISE	WAUY	New York City	49	30	38	55	36	31	0	0	0	0	0	0	239
EVER DECENT	3FUO7	New York City	6	0	10	0	0	16	0	0	0	0	0	0	32

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EVER DEVELOP	3FLF8	New York City	0	0	0	0	0	9	0	0	0	0	0	0	9
EVER DIADEM	3FOF8	New York City	9	2	0	3	0	0	0	0	0	0	0	0	14
EVER DIVINE	3FSA8	Norfolk	11	5	2	10	7	2	0	0	0	0	0	0	37
EVER DYNAMIC	3FUB8	New York City	3	0	0	6	9	2	0	0	0	0	0	0	20
EVER DYNAMIC	3FUB8	Seattle	3	0	0	6	9	2	0	0	0	0	0	0	20
EVER GRADE	3FOW2	Seattle	16	12	14	9	13	11	0	0	0	0	0	0	75
EVER RACER	3FJL4	New York City	0	7	0	0	7	7	0	0	0	0	0	0	21
EVER REACH	3FQO4	New York City	17	16	18	15	17	4	0	0	0	0	0	0	87
EVER REFINE	3FSB4	New York City	11	17	6	0	0	0	0	0	0	0	0	0	34
EVER REPUTE	3FRZ4	New York City	0	34	2	0	0	0	0	0	0	0	0	0	36
EVER RIGHT	3FML3	Los Angeles	0	0	0	1	0	0	0	0	0	0	0	0	1
EVER ROUND	3FQN3	Los Angeles	4	11	15	3	0	0	0	0	0	0	0	0	33
EVER UNIFIC	3FGB9	Anchorage	3	0	1	1	0	1	0	0	0	0	0	0	6
EVER UNISON	3FTL6	Seattle	0	1	0	0	0	0	0	0	0	0	0	0	1
EVER URSULA	3FCB9	Seattle	0	0	0	0	1	0	0	0	0	0	0	0	1
EVER USEFUL	3FCC9	Anchorage	0	0	0	0	3	2	0	0	0	0	0	0	5
EVER UTILE	3FZA9	Seattle	0	0	0	0	0	13	0	0	0	0	0	0	13
EXPLORER OF THE SEAS	ELWX5	Miami	309	199	270	461	427	424	0	0	0	0	0	0	2090
FAIRWEATHER	WTEB	Anchorage	0	0	10	36	25	22	0	0	0	0	0	0	93
FAIRWEATHER	WTEB	Kodiak	0	0	10	36	25	22	0	0	0	0	0	0	93
FALCON ARROW	C6TK8	Anchorage	49	18	73	0	0	0	0	0	0	0	0	0	140
FASCINATION	C6FM9	Miami	0	0	0	0	3	24	0	0	0	0	0	0	27
FEDERAL HUNTER	VRWP2	New Orleans	0	11	47	36	2	0	0	0	0	0	0	0	96
FIDALGO	WUR9616	Kodiak	0	0	0	9	1	0	0	0	0	0	0	0	10
FIGARO	S6PI	Baltimore	20	11	0	5	16	0	0	0	0	0	0	0	52
FISHHAWK	WRB5085	Kodiak	0	0	0	0	24	0	0	0	0	0	0	0	24
FRANCES L	C6YE	Baltimore	86	69	78	64	44	26	0	0	0	0	0	0	367
FRANCONIA	3FWI7	Charleston	0	0	0	0	13	13	0	0	0	0	0	0	26
FREDERICK BOUCHARD	WYT9297	Kodiak	0	0	3	0	0	0	0	0	0	0	0	0	3
FREEDOM	WDB5483	Baltimore	50	46	64	32	17	0	0	0	0	0	0	0	209
GALAXY	C6FU6	Miami	11	10	12	13	10	0	0	0	0	0	0	0	56
GALE WIND	WAZ9548	Anchorage	11	9	9	21	15	18	0	0	0	0	0	0	83
GEMINI VOYAGER	C6FE5	Los Angeles	24	10	10	14	7	33	0	0	0	0	0	0	98
GEMINI VOYAGER	C6FE5	San Francisco	24	10	10	14	7	33	0	0	0	0	0	0	98
GEYSIR	WCZ5528	Norfolk	76	69	73	64	41	67	0	0	0	0	0	0	390
GLADIATOR	WCZ9000	Kodiak	0	0	0	0	1	3	0	0	0	0	0	0	4
GLOIRE	3FPA6	Seattle	74	62	63	4	78	85	0	0	0	0	0	0	366
GOLDEN BEAR	NMRY	San Francisco	0	0	0	0	56	45	0	0	0	0	0	0	101
GORDON GUNTER	WTEO	New Orleans	82	90	59	69	169	122	0	0	0	0	0	0	591
GREAT LAND	WFDP	Seattle	39	42	27	11	20	27	0	0	0	0	0	0	166
GREEN DALE	WCZ5238	Jacksonville	13	2	27	29	14	37	0	0	0	0	0	0	122
GREEN LAKE	WDDI	Baltimore	41	41	43	22	13	34	0	0	0	0	0	0	194
GREEN POINT	WCY4148	New York City	46	29	42	29	60	22	0	0	0	0	0	0	228
GRETA	WCY2853	Kodiak	0	0	0	0	16	0	0	0	0	0	0	0	16
GROTON	KMJL	New York City	14	44	57	26	35	18	0	0	0	0	0	0	194
GSF EXPLORER	WCX5333	New Orleans	59	26	18	87	13	7	0	0	0	0	0	0	210
GUARDSMAN	WBN5978	Anchorage	0	0	0	0	37	64	0	0	0	0	0	0	101
GULF TITAN	WDA5598	Anchorage	4	18	17	7	3	2	0	0	0	0	0	0	51
GUS W. DARNELL	KCDK	Houston	15	16	13	0	0	21	0	0	0	0	0	0	65

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
HALLE FOSS	WCF3930	Kodiak	0	0	2	0	2	0	0	0	0	0	0	0	4
HANJIN OSAKA	A8FS4	New York City	0	33	56	10	44	47	0	0	0	0	0	0	190
HANJIN OTTAWA	DANM	Anchorage	0	0	0	0	0	21	0	0	0	0	0	0	21
HANJIN PORTLAND	A8FS5	New York City	0	0	0	0	1	9	0	0	0	0	0	0	10
HANJIN SHANGHAI	3FGI5	New York City	21	13	0	0	7	2	0	0	0	0	0	0	43
HANSA CENTURY	DHHI	New York City	0	0	0	0	0	48	0	0	0	0	0	0	48
HANSA VISBY	ELWR5	Anchorage	83	38	49	48	47	36	0	0	0	0	0	0	301
HATSU EAGLE	ZNZH6	Seattle	0	0	0	0	0	10	0	0	0	0	0	0	10
HATSU ELITE	VSJG7	Seattle	17	17	16	18	17	13	0	0	0	0	0	0	98
HATSU ENVOY	VSQL9	Seattle	24	26	38	50	40	9	0	0	0	0	0	0	187
HATSU ETHIC	VQFS4	Seattle	22	21	15	16	19	17	0	0	0	0	0	0	110
HATSU EXCEL	VSXV3	Seattle	6	7	7	4	10	8	0	0	0	0	0	0	42
HERBERT C. JACKSON	WL3972	Chicago	0	0	0	10	13	3	0	0	0	0	0	0	26
HERCULES	WBN2074	Anchorage	0	0	0	0	0	10	0	0	0	0	0	0	10
HI'IALAKAI	WTEY	Honolulu	0	19	34	65	69	78	0	0	0	0	0	0	265
HI'IALAKAI	WTEY	Seattle	0	19	34	65	69	78	0	0	0	0	0	0	265
HMI BRENTON REEF	WCY8453	Kodiak	50	33	59	72	45	53	0	0	0	0	0	0	312
HOEGH NEW YORK	LAEI6	New York City	0	0	0	0	0	21	0	0	0	0	0	0	21
HOOD ISLAND	C6LU4	Miami	31	22	21	33	14	17	0	0	0	0	0	0	138
HORIZON ENTERPRISE	KRGB	San Francisco	561	113	14	5	49	471	0	0	0	0	0	0	1213
HORIZON ANCHORAGE	KGTX	Anchorage	99	169	196	90	70	232	0	0	0	0	0	0	856
HORIZON CHALLENGER	WZJC	Jacksonville	72	21	60	64	68	41	0	0	0	0	0	0	326
HORIZON CONSUMER	WCHF	Los Angeles	48	59	58	55	55	50	0	0	0	0	0	0	325
HORIZON CRUSADER	WZJF	Jacksonville	54	50	46	64	70	76	0	0	0	0	0	0	360
HORIZON DISCOVERY	WZJD	Jacksonville	52	47	59	52	57	33	0	0	0	0	0	0	300
HORIZON FAIRBANKS	WPGJ	Anchorage	48	46	29	49	50	43	0	0	0	0	0	0	265
HORIZON FAIRBANKS	WPGJ	Seattle	48	46	29	49	50	43	0	0	0	0	0	0	265
HORIZON HAWAII	KIRF	New York City	1	54	68	32	42	62	0	0	0	0	0	0	259
HORIZON KODIAK	KGTZ	Anchorage	68	58	57	63	103	186	0	0	0	0	0	0	535
HORIZON NAVIGATOR	WPGK	Los Angeles	40	31	46	41	55	38	0	0	0	0	0	0	251
HORIZON PACIFIC	WSRL	Los Angeles	82	77	73	50	72	55	0	0	0	0	0	0	409
HORIZON PRODUCER	WJBJ	New York City	79	68	94	73	71	60	0	0	0	0	0	0	445
HORIZON RELIANCE	WFLH	Los Angeles	80	68	77	81	74	61	0	0	0	0	0	0	441
HORIZON SPIRIT	WFLG	San Francisco	66	56	46	41	21	53	0	0	0	0	0	0	283
HORIZON TACOMA	KGTY	Anchorage	49	57	58	62	114	76	0	0	0	0	0	0	416
HORIZON TRADER	KIRH	San Francisco	33	0	49	44	55	49	0	0	0	0	0	0	230
HOWARD OLSEN	WDB7214	Kodiak	0	0	0	0	10	3	0	0	0	0	0	0	13
HYUNDAI GARNET	9VVN	New York City	33	25	2	0	0	36	0	0	0	0	0	0	96
HYUNDAI GARNET	9VVN	San Francisco	33	25	2	0	0	36	0	0	0	0	0	0	96
INDEPENDENCE	WRJG	Kodiak	0	86	62	30	38	0	0	0	0	0	0	0	216
INDEPENDENCE	WRYG	Baltimore	0	86	62	30	38	0	0	0	0	0	0	0	216
INDIAN OCEAN	C6T2063	New York City	18	14	22	9	3	15	0	0	0	0	0	0	81
INDOTRANS CELEBES	VRZN9	Norfolk	58	14	0	38	15	10	0	0	0	0	0	0	135
INDOTRANS MAKASSA	VRZO2	New Orleans	0	1	0	0	0	33	0	0	0	0	0	0	34
INLAND SEAS	WCJ6214	Chicago	0	0	0	0	1	0	0	0	0	0	0	0	1
INLET RESEARCH	KEC43	Anchorage	1	1	1	1	1	1	0	0	0	0	0	0	6
INSPIRATION	C6FM5	Anchorage	4	4	8	7	11	8	0	0	0	0	0	0	42
IRENES REMEDY	SYAQ	New York City	0	0	18	10	10	18	0	0	0	0	0	0	56
ISLAND CHAMPION	WCZ7046	Anchorage	0	0	0	0	15	13	0	0	0	0	0	0	28

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ISLAND WARRIOR	WDA9217	Anchorage	0	0	0	0	0	5	0	0	0	0	0	0	5
ITB BALTIMORE	WXKM	Baltimore	0	10	25	0	0	1	0	0	0	0	0	0	36
ITB JACKSONVILLE	WNDG	Baltimore	13	0	11	10	12	89	0	0	0	0	0	0	135
ITB MOBILE	KXDB	New York City	0	0	0	0	6	41	0	0	0	0	0	0	47
ITB NEW YORK	WVDG	Baltimore	3	5	18	21	10	5	0	0	0	0	0	0	62
ITB PHILADELPHIA	KSYP	Baltimore	0	0	0	2	39	34	0	0	0	0	0	0	75
ITB PHILADELPHIA	KSYP	Miami	0	0	0	2	39	34	0	0	0	0	0	0	75
IVER FOSS	WYE6442	Kodiak	0	0	0	0	0	14	0	0	0	0	0	0	14
JAG PRAKASH	AUBK	Anchorage	18	0	0	0	0	24	0	0	0	0	0	0	42
JAMES R. BARKER	WYP8657	Chicago	35	0	25	84	95	87	0	0	0	0	0	0	326
JEFFREY FOSS	WCX4608	Kodiak	0	0	0	0	0	3	0	0	0	0	0	0	3
JENS MAERSK	OYYK2	New York City	63	41	39	49	32	42	0	0	0	0	0	0	266
JEPPESEN MAERSK	OWTW2	New York City	12	28	13	23	14	7	0	0	0	0	0	0	97
JOHANNES MAERSK	OWFD2	Miami	16	1	17	0	13	14	0	0	0	0	0	0	61
JOHN BRIX	WCY7560	Kodiak	0	6	0	4	3	0	0	0	0	0	0	0	13
JOHN G. MUNSON	WE3806	Chicago	1	0	4	0	0	0	0	0	0	0	0	0	5
JOHN N. COBB	WMVC	Anchorage	0	0	0	20	32	36	0	0	0	0	0	0	88
JOIDES RESOLUTION	D5BC	Norfolk	1	0	0	0	0	0	0	0	0	0	0	0	1
JOSEPH L. BLOCK	WDA2768	Chicago	4	0	0	0	0	0	0	0	0	0	0	0	4
JUDY LITRICO	KCKB	New Orleans	42	61	35	37	51	21	0	0	0	0	0	0	247
JUSTINE FOSS	WYL4978	Kodiak	1	20	24	0	7	6	0	0	0	0	0	0	58
JUTUL	LAVX5	Anchorage	0	0	0	6	0	0	0	0	0	0	0	0	6
KAPITAN AFANASYEV	UFIL	Seattle	0	0	11	0	0	0	0	0	0	0	0	0	11
KAUAI	WSRH	Los Angeles	46	17	34	41	52	44	0	0	0	0	0	0	234
KAYE E. BARKER	WCF3012	Chicago	11	0	4	26	30	36	0	0	0	0	0	0	107
KEISHO	3FYN4	Seattle	21	0	0	0	0	0	0	0	0	0	0	0	21
KENAI	WSNB	Valdez	11	4	22	31	8	23	0	0	0	0	0	0	99
KENNICOTT	WCY2920	Kodiak	0	0	41	34	24	24	0	0	0	0	0	0	123
KILO MOANA	WDA7827	Honolulu	4	10	12	53	26	18	0	0	0	0	0	0	123
KNORR	KCEJ	Jacksonville	0	0	0	0	0	33	0	0	0	0	0	0	33
KOTZEBUE RESEARCH	KUU619	Anchorage	0	0	0	0	5	29	0	0	0	0	0	0	34
LAUREN FOSS	WDB3834	Kodiak	0	0	0	0	30	58	0	0	0	0	0	0	88
LEE A. TREGURTHA	WUR8857	Chicago	25	0	17	9	13	1	0	0	0	0	0	0	65
LEGEND OF THE SEAS	C6SL5	Miami	56	47	30	10	0	0	0	0	0	0	0	0	143
LEGEND OF THE SEAS	C6SL5	New Orleans	56	47	30	10	0	0	0	0	0	0	0	0	143
LEO FOREST	3FPH8	Seattle	0	0	0	0	55	26	0	0	0	0	0	0	81
LEYLA KALKAVAN	TCCJ7	Norfolk	0	50	32	30	13	13	0	0	0	0	0	0	138
LIBERTY	WRYX	Baltimore	54	40	49	56	33	39	0	0	0	0	0	0	271
LIBERTY EAGLE	WHIA	Houston	20	44	29	48	31	61	0	0	0	0	0	0	233
LIBERTY GLORY	WADP	New Orleans	48	15	0	0	0	0	0	0	0	0	0	0	63
LIBERTY GRACE	WADN	New Orleans	33	37	0	46	13	25	0	0	0	0	0	0	154
LIBERTY SEA	C6UA5	New Orleans	0	0	0	0	0	58	0	0	0	0	0	0	58
LIBERTY SPIRIT	WCPU	New Orleans	31	0	30	8	1	0	0	0	0	0	0	0	70
LIBERTY STAR	WCBP	New Orleans	42	26	58	63	49	58	0	0	0	0	0	0	296
LIBERTY SUN	WCOB	New Orleans	23	26	23	11	14	28	0	0	0	0	0	0	125
LIHUE	WTST	San Francisco	29	40	37	2	50	0	0	0	0	0	0	0	158
LINDA OLDENDORFF	ELRR2	Baltimore	69	42	51	3	0	0	0	0	0	0	0	0	165
LNG ARIES	V7BW7	New York City	43	32	52	40	2	0	0	0	0	0	0	0	169
LNG CAPRICORN	V7BW8	New York City	38	41	42	15	13	21	0	0	0	0	0	0	170

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
LNG GEMINI	V7BW9	Kodiak	21	22	24	16	22	10	0	0	0	0	0	0	115
LNG LEO	V7BX2	New York City	18	0	0	23	25	18	0	0	0	0	0	0	84
LNG TAURUS	V7BX4	New York City	44	50	14	16	14	7	0	0	0	0	0	0	145
LNG VIRGO	V7BX5	New York City	13	41	30	21	16	20	0	0	0	0	0	0	141
LOIS H.	WTD4576	Kodiak	0	0	1	0	1	0	0	0	0	0	0	0	2
LT UNITY	3FCD9	Seattle	1	1	0	1	0	0	0	0	0	0	0	0	3
LT USODIMARE	IBPO	Seattle	0	0	0	0	0	13	0	0	0	0	0	0	13
LTC CALVIN P. TITUS	KJLV	Jacksonville	28	19	6	28	7	5	0	0	0	0	0	0	93
LURLINE	WLVD	San Francisco	46	32	33	39	51	30	0	0	0	0	0	0	231
LYKES ACHIEVER	ZCDJ2	New Orleans	0	0	0	33	33	44	0	0	0	0	0	0	110
LYKES AMBASSADOR	ZCDJ4	Houston	0	0	5	0	1	0	0	0	0	0	0	0	6
LYKES DISCOVERER	WGXO	Houston	90	68	84	82	69	53	0	0	0	0	0	0	446
LYKES EAGLE	VSUA7	Anchorage	17	18	13	32	58	61	0	0	0	0	0	0	199
LYKES EXPLORER	WGLA	Houston	39	58	43	45	41	47	0	0	0	0	0	0	273
LYKES LIBERATOR	WGXN	Houston	178	148	130	124	127	141	0	0	0	0	0	0	848
LYKES MOTIVATOR	WABU	Houston	55	41	47	52	65	37	0	0	0	0	0	0	297
LYKES NAVIGATOR	WGMJ	Houston	77	64	89	69	93	102	0	0	0	0	0	0	494
LYKES RANGER	ZIYE7	Houston	26	20	27	11	17	13	0	0	0	0	0	0	114
MAASDAM	PFRO	Miami	29	38	35	30	38	0	0	0	0	0	0	0	170
MACKINAC BRIDGE	JKES	New York City	49	51	53	55	61	47	0	0	0	0	0	0	316
MADISON MAERSK	OVJB2	San Francisco	15	7	23	19	17	16	0	0	0	0	0	0	97
MAERSK ARIZONA	KAKG	Baltimore	6	0	0	0	3	19	0	0	0	0	0	0	28
MAERSK ARKANSAS	WDB9984	Baltimore	0	0	0	13	6	46	0	0	0	0	0	0	65
MAERSK CAROLINA	WBDS	Charleston	12	32	0	21	18	9	0	0	0	0	0	0	92
MAERSK CONSTELLATION	WRYJ	Houston	37	10	13	5	32	3	0	0	0	0	0	0	100
MAERSK DAMMAM	V2OE3	San Francisco	0	0	0	0	0	3	0	0	0	0	0	0	3
MAERSK DOUALA	A8FC9	Charleston	0	0	10	0	0	0	0	0	0	0	0	0	10
MAERSK DUBLIN	V2OE1	New York City	3	0	0	2	1	0	0	0	0	0	0	0	6
MAERSK GEORGIA	WAHP	New York City	0	6	30	7	6	10	0	0	0	0	0	0	59
MAERSK MISSOURI	WAHV	Norfolk	3	38	30	18	41	10	0	0	0	0	0	0	140
MAERSK NEWARK	A8CF2	New York City	37	34	20	42	55	58	0	0	0	0	0	0	246
MAERSK PECEM	V2OU9	Charleston	0	12	18	31	21	20	0	0	0	0	0	0	102
MAERSK TAIKI	9VIG	Baltimore	5	22	5	2	0	0	0	0	0	0	0	0	34
MAERSK TAIYO	9VJO	Jacksonville	6	0	0	0	0	0	0	0	0	0	0	0	6
MAERSK TEAL	S6HK	Charleston	0	0	0	20	0	0	0	0	0	0	0	0	20
MAERSK TOLEDO	MZOJ8	Seattle	1	5	16	37	35	40	0	0	0	0	0	0	134
MAERSK VALENCIA	DAPG	New York City	81	63	8	6	7	19	0	0	0	0	0	0	184
MAERSK WAVE	S6TV	Baltimore	0	0	82	61	57	40	0	0	0	0	0	0	240
MAERSK WIND	S6TY	Baltimore	76	70	91	0	41	58	0	0	0	0	0	0	336
MAGLEBY MAERSK	OUSH2	New York City	48	36	45	35	34	48	0	0	0	0	0	0	246
MAHARASHTRA	VTSQ	Seattle	23	6	0	0	0	24	0	0	0	0	0	0	53
MAHIMAHI	WHRN	San Francisco	44	30	0	42	41	40	0	0	0	0	0	0	197
MAIA H.	WYX2079	Kodiak	8	1	3	9	0	0	0	0	0	0	0	0	21
MAJESTIC MAERSK	OUJH2	New York City	36	22	52	14	37	16	0	0	0	0	0	0	177
MANOA	KDBG	San Francisco	34	53	52	49	62	56	0	0	0	0	0	0	306
MANUKAI	WRGD	New York City	42	36	37	45	33	41	0	0	0	0	0	0	234
MANULANI	WDC4696	New York City	0	0	0	0	0	16	0	0	0	0	0	0	16
MARCY J	WCF4791	Kodiak	2	23	0	0	0	8	0	0	0	0	0	0	33

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MAREN MAERSK	OWZU2	Los Angeles	41	27	34	24	22	27	0	0	0	0	0	0	175
MARGRETHE MAERSK	OYSN2	Los Angeles	17	32	23	23	0	0	0	0	0	0	0	0	95
MARIE MAERSK	OULL2	New York City	59	0	60	0	57	0	0	0	0	0	0	0	176
MARIELLE BOLTEN	ELZH9	New York City	2	0	4	1	30	14	0	0	0	0	0	0	51
MARK HANNAH	WYZ5243	Chicago	0	0	1	3	6	7	0	0	0	0	0	0	17
MARLIN	6ZXG	New Orleans	0	0	0	1	78	64	0	0	0	0	0	0	143
MARTORELL	HPNE	New York City	70	62	62	49	25	82	0	0	0	0	0	0	350
MATANUSKA	WN4201	Kodiak	6	0	0	0	8	0	0	0	0	0	0	0	14
MATHILDE MAERSK	OUUU2	Los Angeles	14	28	16	42	20	56	0	0	0	0	0	0	176
MATSONIA	KHRC	San Francisco	43	59	47	22	21	19	0	0	0	0	0	0	211
MAUI	WSLH	Los Angeles	19	27	36	48	40	33	0	0	0	0	0	0	203
MAUNAWILI	WDB7104	New York City	47	46	46	41	33	25	0	0	0	0	0	0	238
MAURICE EWING	WLDZ	New York City	15	0	23	0	0	0	0	0	0	0	0	0	38
MAYVIEW MAERSK	OWEB2	San Francisco	47	23	21	33	28	11	0	0	0	0	0	0	163
MCARTHUR II	WTEJ	Seattle	0	0	0	20	111	115	0	0	0	0	0	0	246
MCKEE SONS	WCZ9703	Chicago	13	0	32	75	86	56	0	0	0	0	0	0	262
MC-KINNEY MAERSK	OUZW2	New York City	19	16	15	20	13	13	0	0	0	0	0	0	96
MEKONG PIONEER	V2JN	Miami	28	36	42	40	32	36	0	0	0	0	0	0	214
MELVILLE	WECB	Los Angeles	34	79	89	84	75	58	0	0	0	0	0	0	419
MERCURY	C6SQ6	Miami	10	6	4	3	2	5	0	0	0	0	0	0	30
MESABI MINER	WYQ4356	Chicago	57	0	3	32	46	23	0	0	0	0	0	0	161
METTE MAERSK	OXKT2	Los Angeles	0	7	32	27	25	60	0	0	0	0	0	0	151
MIDNIGHT SUN	WAHG	Seattle	63	84	69	61	73	72	0	0	0	0	0	0	422
MIKI HANA	WTW9252	Kodiak	5	2	0	0	1	0	0	0	0	0	0	0	8
MILLER FREEMAN	WTDM	Seattle	0	58	104	92	151	103	0	0	0	0	0	0	508
MOKIHANA	WNRD	San Francisco	55	73	64	30	40	40	0	0	0	0	0	0	302
MOKU PAHU	WBWK	San Francisco	29	24	10	44	32	50	0	0	0	0	0	0	189
MOL COMMITMENT	9VID2	Charleston	35	38	47	37	34	1	0	0	0	0	0	0	192
MOL INNOVATION	9VVP	San Francisco	18	23	43	12	32	20	0	0	0	0	0	0	148
MOL THAMES	3EFV8	Norfolk	0	0	0	0	0	16	0	0	0	0	0	0	16
MOL VELOCITY	9VVK	Seattle	39	18	41	40	40	41	0	0	0	0	0	0	219
MONTAUK	WDCJ	New Orleans	43	27	10	2	7	11	0	0	0	0	0	0	100
MSC DONATA	A8EU2	Anchorage	48	34	37	28	32	28	0	0	0	0	0	0	207
MSC MATILDE	HODP	New York City	45	29	9	6	6	7	0	0	0	0	0	0	102
NANCY FOSTER	WTER	Norfolk	13	65	34	44	45	47	0	0	0	0	0	0	248
NANUQ	WCY8498	Valdez	0	0	1	2	2	3	0	0	0	0	0	0	8
NATOMA	WBB5799	Kodiak	0	1	0	0	0	0	0	0	0	0	0	0	1
NAVAJO	WCT5737	Kodiak	18	11	6	20	9	4	0	0	0	0	0	0	68
NAVIGATOR	WBO3345	Anchorage	2	0	41	1	0	0	0	0	0	0	0	0	44
NAVIGATOR OF THE SEAS	C6FU4	Miami	20	23	1	18	2	22	0	0	0	0	0	0	86
NEW HORIZON	WKWB	Los Angeles	19	39	53	36	0	10	0	0	0	0	0	0	157
NOAA SHIP KA'IMIMOANA	WTEU	Honolulu	0	33	76	49	30	65	0	0	0	0	0	0	253
NORASIA ATLAS	A8GX4	New York City	0	0	0	0	54	12	0	0	0	0	0	0	66
NORDEAGLE	P3KE8	New York City	0	17	37	19	0	0	0	0	0	0	0	0	73
NORTH STAR	KIYI	Seattle	68	59	53	42	60	71	0	0	0	0	0	0	353
NORTHERN VICTOR	WCZ6534	Kodiak	4	3	5	3	0	6	0	0	0	0	0	0	21
NORWEGIAN DREAM	C6LG5	New Orleans	20	12	9	1	10	0	0	0	0	0	0	0	52
NORWEGIAN SEA	C6DM2	Houston	12	13	17	22	20	11	0	0	0	0	0	0	95
NOVA TERRA	C6IZ7	Miami	29	31	19	19	0	0	0	0	0	0	0	0	98

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
NUKA ISLAND	WAR2130	Anchorage	0	0	1	0	0	0	0	0	0	0	0	0	1
OCEAN CONFIDENCE	V7EA2	Houston	0	0	0	0	0	8	0	0	0	0	0	0	8
OCEAN MARINER	WCF3990	Anchorage	0	0	0	3	0	0	0	0	0	0	0	0	3
OCEAN PREFACE	VRUL7	New Orleans	18	10	10	5	0	0	0	0	0	0	0	0	43
OCEAN RANGER	WAM7635	Anchorage	0	0	0	32	15	3	0	0	0	0	0	0	50
OCEAN RELIANCE	WADY	Kodiak	21	22	23	15	4	16	0	0	0	0	0	0	101
OCEAN SERVICE	WTW9263	Kodiak	0	1	0	0	0	0	0	0	0	0	0	0	1
OCEAN TITAN	WDB9647	Anchorage	1	13	5	4	1	3	0	0	0	0	0	0	27
OCEAN VICTORY	V7EB8	Kodiak	2	0	0	0	0	0	0	0	0	0	0	0	2
OLEANDER	PJJU	New York City	14	1	16	9	4	0	0	0	0	0	0	0	44
OLGA MAERSK	OXBB2	New York City	14	19	21	12	8	0	0	0	0	0	0	0	74
OLIVIA MAERSK	OXKO2	Miami	29	6	6	37	17	34	0	0	0	0	0	0	129
OLUF MAERSK	OXFU2	New York City	23	37	17	0	0	0	0	0	0	0	0	0	77
OLYMPIAN HIGHWAY	3FSH4	Seattle	0	0	0	13	17	0	0	0	0	0	0	0	30
OOCL AMERICA	VRWE8	Seattle	9	16	19	12	4	15	0	0	0	0	0	0	75
OOCL ATLANTA	VRAR6	Anchorage	0	0	0	42	57	70	0	0	0	0	0	0	169
OOCL CALIFORNIA	VRWC8	Seattle	55	30	41	22	32	16	0	0	0	0	0	0	196
OOCL FAIR	VRWB8	Los Angeles	23	7	14	9	7	12	0	0	0	0	0	0	72
OOCL FIDELITY	VRWG5	Los Angeles	13	7	27	14	25	13	0	0	0	0	0	0	99
OOCL FRIENDSHIP	VRWD3	Los Angeles	0	0	58	28	27	39	0	0	0	0	0	0	152
OOCL NETHERLANDS	VRVN6	Los Angeles	1	7	35	31	39	11	0	0	0	0	0	0	124
OOSTERDAM	PBKH	Anchorage	4	2	0	0	0	0	0	0	0	0	0	0	6
ORANGE STAR	ELFS7	New York City	0	0	91	88	82	75	0	0	0	0	0	0	336
OREGON II	WTDO	New Orleans	55	87	110	77	51	70	0	0	0	0	0	0	450
ORIENTE SHINE	H9AL	Seattle	31	20	16	17	15	23	0	0	0	0	0	0	122
ORIENTE VICTORIA	3FVG8	Seattle	42	39	0	0	0	0	0	0	0	0	0	0	81
ORION VOYAGER	C6MC5	Baltimore	0	0	101	91	68	26	0	0	0	0	0	0	286
OSCAR DYSON	WTEP	Kodiak	0	1	0	0	0	0	0	0	0	0	0	0	1
OSCAR ELTON SETTE	WTEE	Jacksonville	43	43	25	27	21	55	0	0	0	0	0	0	214
OTELLO	SCFH	New York City	0	11	14	0	9	0	0	0	0	0	0	0	34
OURO DO BRASIL	ELPP9	Baltimore	28	21	34	21	1	0	0	0	0	0	0	0	105
OVERSEAS CHICAGO	KBCF	Valdez	4	27	31	7	0	31	0	0	0	0	0	0	100
OVERSEAS HARRIETTE	WRFJ	Houston	1	0	14	49	33	47	0	0	0	0	0	0	144
OVERSEAS JOYCE	WUQL	Jacksonville	29	19	22	13	17	13	0	0	0	0	0	0	113
OVERSEAS MARILYN	WFQB	Houston	0	0	0	0	30	13	0	0	0	0	0	0	43
OVERSEAS NEW ORLEANS	WFKW	Houston	47	34	29	38	40	46	0	0	0	0	0	0	234
OVERSEAS NEW YORK	WMCK	Valdez	25	22	22	9	10	7	0	0	0	0	0	0	95
OVERSEAS PHILADELPHIA	WGDB	Houston	0	0	0	0	6	13	0	0	0	0	0	0	19
OVERSEAS PHILADELPHIA	WGDB	Miami	0	0	0	0	6	13	0	0	0	0	0	0	19
OVERSEAS WASHINGTON	WFGV	Valdez	29	23	39	21	7	0	0	0	0	0	0	0	119
P&O NEDLLOYD ANDES	ELYY5	Anchorage	0	34	80	68	29	0	0	0	0	0	0	0	211
P&O NEDLLOYD VERA CRUZ	WDC2886	Houston	0	34	52	32	14	0	0	0	0	0	0	0	132
PACIFIC AVENGER	WCY8175	Kodiak	3	32	8	6	110	5	0	0	0	0	0	0	164
PACIFIC CHALLENGER	WDA3588	Kodiak	356	295	123	0	0	6	0	0	0	0	0	0	780
PACIFIC FREEDOM	WDJF	Kodiak	0	0	0	3	12	0	0	0	0	0	0	0	15

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PACIFIC PATRIOT	WDB6493	Kodiak	40	0	28	54	25	33	0	0	0	0	0	0	180
PACIFIC RAVEN	WDB7583	Kodiak	76	37	99	184	266	163	0	0	0	0	0	0	825
PACIFIC STAR	WCW7740	Kodiak	0	1	0	0	0	0	0	0	0	0	0	0	1
PANDALUS	WAV7611	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
PARAGON	WDA2311	Kodiak	41	12	151	134	88	66	0	0	0	0	0	0	492
PATHFINDER	WBN8467	Valdez	5	0	2	2	2	1	0	0	0	0	0	0	12
PATRIOT	WQVY	Baltimore	0	42	39	39	23	39	0	0	0	0	0	0	182
PAUL R. TREGURTHA	WYR4481	Chicago	34	0	7	65	65	84	0	0	0	0	0	0	255
PERSEVERANCE	WSKH	Houston	4	0	0	0	8	11	0	0	0	0	0	0	23
PHOENIX VOYAGER	C6QE3	San Francisco	28	5	17	16	7	12	0	0	0	0	0	0	85
PHYLLIS DUNLAP	WDA6552	Kodiak	0	23	18	76	4	47	0	0	0	0	0	0	168
PITTSBURG	ELTQ6	Baltimore	60	55	57	22	0	0	0	0	0	0	0	0	194
POINT BARROW	WBM5088	Anchorage	0	0	0	0	13	21	0	0	0	0	0	0	34
POLAR ADVENTURE	WAZV	New Orleans	40	17	50	33	29	18	0	0	0	0	0	0	187
POLAR ALASKA	KSBK	Valdez	51	38	8	12	41	43	0	0	0	0	0	0	193
POLAR CALIFORNIA	WMCV	Los Angeles	29	16	22	26	9	68	0	0	0	0	0	0	170
POLAR DISCOVERY	WACW	New Orleans	24	11	9	28	20	28	0	0	0	0	0	0	120
POLAR EAGLE	ELPT3	Anchorage	183	166	191	213	1	176	0	0	0	0	0	0	930
POLAR ENDEAVOUR	WCAJ	New Orleans	13	10	11	28	22	28	0	0	0	0	0	0	112
POLAR RESOLUTION	WDJK	New Orleans	41	48	70	80	21	44	0	0	0	0	0	0	304
POWHATAN	WCZ5243	Kodiak	0	0	0	9	0	0	0	0	0	0	0	0	9
PREMIUM DO BRASIL	A8BL4	Baltimore	16	22	13	13	0	5	0	0	0	0	0	0	69
PRESIDENT ADAMS	WRYW	Los Angeles	69	66	64	60	45	61	0	0	0	0	0	0	365
PRESIDENT ADAMS	WRYW	Seattle	69	66	64	60	45	61	0	0	0	0	0	0	365
PRESIDENT GRANT	WCY2098	Los Angeles	46	53	62	50	45	34	0	0	0	0	0	0	290
PRESIDENT JACKSON	WRYC	Los Angeles	38	37	37	45	45	31	0	0	0	0	0	0	233
PRESIDENT JACKSON	WRYC	Seattle	38	37	37	45	45	31	0	0	0	0	0	0	233
PRESIDENT POLK	WRYD	Los Angeles	87	52	48	26	50	69	0	0	0	0	0	0	332
PRESIDENT POLK	WRYD	Seattle	87	52	48	26	50	69	0	0	0	0	0	0	332
PRESIDENT TRUMAN	WNDP	Los Angeles	35	52	12	12	58	30	0	0	0	0	0	0	199
PRESIDENT TRUMAN	WNDP	Seattle	35	52	12	12	58	30	0	0	0	0	0	0	199
PRESIDENT WILSON	WCY3438	Los Angeles	54	41	38	31	21	36	0	0	0	0	0	0	221
PRESQUE ISLE	WZE4928	Chicago	0	0	0	4	34	35	0	0	0	0	0	0	73
PRIDE OF BALTIMORE II	WUW2120	Baltimore	0	0	1	16	64	45	0	0	0	0	0	0	126
PRINCE WILLIAM SOUND	WSDX	Valdez	16	13	13	30	2	1	0	0	0	0	0	0	75
PURITAN	ZCDH9	Miami	56	44	49	20	8	7	0	0	0	0	0	0	184
PUSAN SENATOR	DQVG	Seattle	23	14	1	10	1	5	0	0	0	0	0	0	54
R.J. PFEIFFER	WRJP	Los Angeles	1	10	44	32	11	1	0	0	0	0	0	0	99
R.V. DAY	WS6709	Kodiak	0	0	1	0	0	0	0	0	0	0	0	0	1
RAINIER	WTEF	Seattle	0	0	21	76	33	47	0	0	0	0	0	0	177
RANGER	WBN5979	Seattle	0	0	7	3	11	1	0	0	0	0	0	0	22
REBECCA LYNN	WCW7977	Chicago	0	0	0	0	2	2	0	0	0	0	0	0	4
REDFIN	WTP2735	Kodiak	0	1	0	1	8	3	0	0	0	0	0	0	13
REDOUBT	WCG3013	Anchorage	0	0	0	0	17	3	0	0	0	0	0	0	20
REGAL PRINCESS	ZCBU4	Anchorage	0	24	27	12	4	0	0	0	0	0	0	0	67
REGULUS VOYAGER	C6FE6	San Francisco	57	40	5	8	44	39	0	0	0	0	0	0	193
RESOLUTION	WBR6941	Kodiak	0	0	0	0	0	1	0	0	0	0	0	0	1
RESOLVE	WCZ5535	Baltimore	11	27	18	13	1	10	0	0	0	0	0	0	80
RHAPSODY OF THE SEAS	C6UA2	Houston	0	0	0	19	28	17	0	0	0	0	0	0	64

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
RHINE FOREST	V7EI9	New Orleans	35	24	38	44	65	40	0	0	0	0	0	0	246
RICKMERS HAMBERG	V7DS3	New Orleans	16	4	2	1	0	0	0	0	0	0	0	0	23
RIO GALLEGOS I	HODT	Seattle	6	5	6	0	0	0	0	0	0	0	0	0	17
ROBERT C. SEAMENS	WDA4486	Kodiak	1	12	29	45	10	13	0	0	0	0	0	0	110
ROGER BLOUGH	WZP8164	Chicago	9	0	0	0	5	5	0	0	0	0	0	0	19
ROGER REVELLE	KAOU	New Orleans	83	53	62	86	68	61	0	0	0	0	0	0	413
RONALD H. BROWN	WTEC	New Orleans	75	68	63	0	0	0	0	0	0	0	0	0	206
ROTTERDAM	PDGS	Anchorage	24	52	21	4	13	26	0	0	0	0	0	0	140
ROUGHNECK	WTW9262	Kodiak	2	0	6	2	3	6	0	0	0	0	0	0	19
RUBIN ARTEMIS	3FAH7	Seattle	4	19	16	25	28	37	0	0	0	0	0	0	129
RUBIN PEARL	YJQA8	Seattle	55	18	62	42	51	34	0	0	0	0	0	0	262
RYNDAM	PHFV	Miami	4	2	14	11	11	0	0	0	0	0	0	0	42
S/R BAYTOWN	KFPM	Valdez	3	28	15	0	3	18	0	0	0	0	0	0	67
S/R COLUMBIA BAY	WFQE	Los Angeles	9	0	1	2	0	2	0	0	0	0	0	0	14
S/R LONG BEACH	WHCA	Los Angeles	4	3	0	0	0	0	0	0	0	0	0	0	7
S/R PUGET SOUND	WXBZ	Valdez	0	0	0	3	6	0	0	0	0	0	0	0	9
S/R WILMINGTON	WBVZ	Houston	0	3	0	0	5	11	0	0	0	0	0	0	19
SAFMARINE ZAMBEZI	A8CE9	New York City	64	30	13	10	2	11	0	0	0	0	0	0	130
SALLY MAERSK	OZHS2	Seattle	58	3	1	0	0	11	0	0	0	0	0	0	73
SAM M. TAALAK	WCX5321	Kodiak	0	0	0	0	1	19	0	0	0	0	0	0	20
SAMSON MARINER	WCN3586	Kodiak	10	6	10	3	8	13	0	0	0	0	0	0	50
SANDRA FOSS	WYL4908	Kodiak	0	0	0	0	0	20	0	0	0	0	0	0	20
SANTA BARBARA	MGYF6	Seattle	0	0	0	29	13	30	0	0	0	0	0	0	72
SAUDI ABHA	HZRX	Baltimore	16	51	30	19	12	20	0	0	0	0	0	0	148
SAUDI DIRIYAH	HZZB	Houston	23	3	50	35	9	1	0	0	0	0	0	0	121
SAUDI HOFUF	HZZC	Houston	11	14	24	16	13	11	0	0	0	0	0	0	89
SAUDI TABUK	HZZD	Houston	38	22	55	64	61	14	0	0	0	0	0	0	254
SCHACKENBORG	ZCIH7	Houston	20	28	70	69	40	6	0	0	0	0	0	0	233
SEA HAWK	WDA3282	Kodiak	0	0	0	22	0	11	0	0	0	0	0	0	33
SEA PRINCE	WYT8569	Anchorage	25	72	34	29	60	86	0	0	0	0	0	0	306
SEA RANGER	WBM8733	Anchorage	0	0	0	0	18	18	0	0	0	0	0	0	36
SEA RELIANCE	WEOB	Kodiak	9	3	4	0	0	0	0	0	0	0	0	0	16
SEA STORM	WCV9132	Kodiak	0	0	0	0	0	1	0	0	0	0	0	0	1
SEA VENTURE	WCC7684	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
SEA VICTORY	WCY6777	Anchorage	0	0	0	0	0	13	0	0	0	0	0	0	13
SEA VIKING	WCE8951	Anchorage	0	0	0	7	23	35	0	0	0	0	0	0	65
SEA VOYAGER	WCX9106	Valdez	45	45	56	52	51	55	0	0	0	0	0	0	304
SEABULK AMERICA	WWYY	Kodiak	1	0	0	0	56	26	0	0	0	0	0	0	83
SEABULK ARCTIC	WCY7054	Kodiak	34	18	18	22	34	26	0	0	0	0	0	0	152
SEABULK MONTANA	WCW9126	Anchorage	237	100	108	107	109	111	0	0	0	0	0	0	772
SEABULK PRIDE	WCY7052	Kodiak	20	24	34	40	72	27	0	0	0	0	0	0	217
SEABULK TRADER	KNJK	Miami	30	42	35	36	26	33	0	0	0	0	0	0	202
SEA-LAND ACHIEVER	WPKD	Houston	60	67	41	34	51	58	0	0	0	0	0	0	311
SEA-LAND ATLANTIC	KRLZ	Houston	54	38	33	52	49	39	0	0	0	0	0	0	265
SEA-LAND CHAMPION	MCDZ2	San Francisco	28	18	2	18	23	0	0	0	0	0	0	0	89
SEA-LAND COMET	WDB9950	Norfolk	49	67	49	41	16	35	0	0	0	0	0	0	257
SEA-LAND COMMITMENT	KRPB	Houston	56	60	57	56	59	32	0	0	0	0	0	0	320
SEA-LAND DEFENDER	KGJB	San Francisco	92	51	79	37	0	0	0	0	0	0	0	0	259
SEA-LAND DEVELOPER	KHRH	Houston	35	2	63	60	12	0	0	0	0	0	0	0	172

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Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SEA-LAND EAGLE	MCDZ9	Los Angeles	0	0	16	31	21	43	0	0	0	0	0	0	111
SEA-LAND ENDURANCE	V7HX3	Seattle	0	0	0	0	12	10	0	0	0	0	0	0	22
SEA-LAND EXPRESS	V7HH7	Los Angeles	0	0	4	36	14	1	0	0	0	0	0	0	55
SEA-LAND FLORIDA	KRHX	Houston	48	54	45	51	77	65	0	0	0	0	0	0	340
SEA-LAND FREEDOM	V7AM3	Norfolk	1	42	47	27	0	0	0	0	0	0	0	0	117
SEA-LAND INDEPENDENCE	WGJC	Los Angeles	31	28	25	58	2	0	0	0	0	0	0	0	144
SEALAND INNOVATOR	V7IA8	Seattle	0	0	0	0	0	6	0	0	0	0	0	0	6
SEA-LAND INTEGRITY	WPVD	Houston	166	301	388	425	257	25	0	0	0	0	0	0	1562
SEA-LAND INTREPID	WDB9949	Charleston	35	11	11	2	30	20	0	0	0	0	0	0	109
SEA-LAND LIBERATOR	KHRP	San Francisco	54	27	54	70	43	33	0	0	0	0	0	0	281
SEA-LAND MARINER	V7AM5	New York City	31	38	24	37	22	0	0	0	0	0	0	0	152
SEA-LAND MERCURY	MCDW9	San Francisco	75	67	44	31	40	30	0	0	0	0	0	0	287
SEA-LAND METEOR	WDB9951	Miami	23	22	14	17	30	36	0	0	0	0	0	0	142
SEA-LAND MOTIVATOR	WAAH	Houston	40	67	94	79	81	75	0	0	0	0	0	0	436
SEA-LAND PATRIOT	KHRF	San Francisco	63	74	59	65	89	52	0	0	0	0	0	0	402
SEA-LAND PERFORMANCE	KRPD	Houston	23	33	25	24	22	29	0	0	0	0	0	0	156
SEA-LAND PRIDE	WDB9444	Houston	65	68	89	61	59	83	0	0	0	0	0	0	425
SEA-LAND QUALITY	KRNJ	Houston	12	31	36	47	45	52	0	0	0	0	0	0	223
SEA-LAND RACER	MCDW2	Charleston	25	21	0	0	0	0	0	0	0	0	0	0	46
SEA-LAND VOYAGER	KHRK	Los Angeles	68	53	50	37	25	0	0	0	0	0	0	0	233
SELMA KALKAVAN	V7GX5	Norfolk	0	59	60	72	53	38	0	0	0	0	0	0	282
SENECA	WBN8469	Anchorage	0	0	0	0	50	63	0	0	0	0	0	0	113
SIDNEY FOSS	WYL5445	Kodiak	35	33	33	32	15	31	0	0	0	0	0	0	179
SILKEBORG	EIJV	Houston	0	0	31	40	26	25	0	0	0	0	0	0	122
SILVER SPRAY	WAO9040	Kodiak	0	4	0	0	0	0	0	0	0	0	0	0	4
SINE MAERSK	OZOK2	Seattle	0	0	49	0	15	7	0	0	0	0	0	0	71
SINUK	WCQ8110	Anchorage	0	0	0	86	119	138	0	0	0	0	0	0	343
SKANDERBORG	ZCIG4	Houston	23	0	0	0	15	20	0	0	0	0	0	0	58
SKODSBORG	ZCIJ7	Baltimore	26	10	10	17	15	8	0	0	0	0	0	0	86
SNOHOMISH	WSQ8098	Kodiak	0	0	0	0	13	9	0	0	0	0	0	0	22
SOFIE MAERSK	OZUN2	Seattle	0	56	5	17	46	0	0	0	0	0	0	0	124
SOL DO BRASIL	ELQQ4	Baltimore	0	4	6	9	14	17	0	0	0	0	0	0	50
SOROE MAERSK	OYKJ2	Seattle	38	0	33	13	1	35	0	0	0	0	0	0	120
SOUND RELIANCE	WXAE	Kodiak	6	138	23	36	5	35	0	0	0	0	0	0	243
SPIRIT OF OCEANUS	C6PJ8	Kodiak	0	0	0	0	0	2	0	0	0	0	0	0	2
SS BADGER	WBD4889	Chicago	0	0	0	0	0	9	0	0	0	0	0	0	9
ST PAUL RESEARCH	KEY796	Anchorage	0	3	6	1	0	0	0	0	0	0	0	0	10
ST. MARY'S CHALLENGER	WDB9135	Chicago	8	0	0	0	0	0	0	0	0	0	0	0	8
STACEY FOSS	WYL4909	Kodiak	0	0	0	0	0	11	0	0	0	0	0	0	11
STAR ALABAMA	LAVU4	Baltimore	57	57	33	36	25	34	0	0	0	0	0	0	242
STAR AMERICA	LAVV4	Jacksonville	10	24	22	24	15	0	0	0	0	0	0	0	95
STAR EAGLE	LAWO2	Baltimore	31	23	0	0	25	20	0	0	0	0	0	0	99
STAR EVVIVA	LAHE2	Jacksonville	30	30	30	26	18	40	0	0	0	0	0	0	174
STAR FLORIDA	LAVW4	Houston	0	0	0	24	28	2	0	0	0	0	0	0	54
STAR GEIRANGER	LAKQ5	Seattle	0	35	25	0	31	34	0	0	0	0	0	0	125
STAR GRAN	LADR4	Los Angeles	0	19	18	13	22	0	0	0	0	0	0	0	72
STAR GRINDANGER	LAKR5	Norfolk	20	0	0	0	0	0	0	0	0	0	0	0	20

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
STAR HANSA	LAXP4	Jacksonville	0	0	41	12	28	29	0	0	0	0	0	0	110
STAR HARMONIA	LAGB5	Baltimore	40	48	13	21	20	38	0	0	0	0	0	0	180
STAR HERDLA	LAVD4	Baltimore	5	0	0	19	17	0	0	0	0	0	0	0	41
STAR HIDRA	LAVN4	Baltimore	19	0	5	0	18	15	0	0	0	0	0	0	57
STAR INDIANA	S6BE	Baltimore	33	18	17	14	11	0	0	0	0	0	0	0	93
STAR ISMENE	LANT5	Baltimore	30	28	26	25	0	0	0	0	0	0	0	0	109
STAR ISTIND	LAMP5	Houston	0	0	16	10	14	6	0	0	0	0	0	0	46
STAR JAPAN	LAZV5	Baltimore	13	51	38	35	85	0	0	0	0	0	0	0	222
STATENDAM	PHSG	Miami	27	40	27	14	0	0	0	0	0	0	0	0	108
STELLAR SEA	KGCJ	Kodiak	0	0	0	0	5	0	0	0	0	0	0	0	5
STELLAR VOYAGER	C6FV4	Seattle	5	3	1	3	0	0	0	0	0	0	0	0	12
STEWART J. CORT	WDB4570	Chicago	6	0	1	10	14	10	0	0	0	0	0	0	41
STIMSON	KF002	Kodiak	33	15	10	20	19	21	0	0	0	0	0	0	118
STRONG PATRIOT	WCZ8589	Norfolk	1	11	3	14	43	25	0	0	0	0	0	0	97
SUMIDA	3FMX7	New York City	0	0	0	4	13	11	0	0	0	0	0	0	28
SUNBELT SPIRIT	V7DK4	New York City	0	0	0	0	9	3	0	0	0	0	0	0	12
SUSAN MAERSK	OYIK2	Seattle	46	0	12	2	0	19	0	0	0	0	0	0	79
SUSAN W. HANNAH	WAH9146	Chicago	0	0	0	0	6	2	0	0	0	0	0	0	8
SVEND MAERSK	OYJS2	Seattle	27	19	0	50	0	20	0	0	0	0	0	0	116
SWIFT ARROW	C6NI7	Anchorage	27	48	32	21	31	23	0	0	0	0	0	0	182
SYNERGY	NL9H	Kodiak	0	0	46	51	66	81	0	0	0	0	0	0	244
T/V ENTERPRISE	KVMU	New York City	74	76	0	0	0	0	0	0	0	0	0	0	150
T/V STATE OF MAINE	WCAH	Charleston	0	0	0	0	160	26	0	0	0	0	0	0	186
TAIO FRONTIER	3EZF5	Anchorage	56	50	62	29	17	0	0	0	0	0	0	0	214
TALISMAN	LAOW5	Jacksonville	21	0	1	37	20	0	0	0	0	0	0	0	79
TAMESIS	LAOL5	Norfolk	0	11	0	0	12	9	0	0	0	0	0	0	32
TAMPA	LMWO3	Baltimore	11	10	8	0	18	12	0	0	0	0	0	0	59
TAN'ERLIQ	WCY8497	Valdez	0	2	7	0	2	9	0	0	0	0	0	0	20
TAUSALA SAMOA	V2FA2	Los Angeles	30	27	31	24	27	31	0	0	0	0	0	0	170
TENACIOUS	WTK2123	Kodiak	1	0	0	0	0	0	0	0	0	0	0	0	1
TEXAS CLIPPER II	KVWA	Houston	0	0	0	0	0	43	0	0	0	0	0	0	43
THOMAS G. THOMPSON	KTDQ	Seattle	0	0	0	12	71	62	0	0	0	0	0	0	145
THOMAS JEFFERSON	WTEA	Norfolk	0	0	0	0	12	6	0	0	0	0	0	0	18
TIGER	WCE2134	Kodiak	0	0	1	0	0	0	0	0	0	0	0	0	1
TIGLAX	WZ3423	Anchorage	0	0	0	0	1	2	0	0	0	0	0	0	3
TITAN	WAW9232	Kodiak	15	10	5	10	9	4	0	0	0	0	0	0	53
TMM TABASCO	VSUA5	Anchorage	35	42	24	6	1	0	0	0	0	0	0	0	108
TONSINA	KJDG	Valdez	0	25	31	0	0	0	0	0	0	0	0	0	56
TREIN MAERSK	MSQQ8	Baltimore	21	26	31	22	35	4	0	0	0	0	0	0	139
TUSTUMENA	WNGW	Kodiak	103	88	18	21	19	13	0	0	0	0	0	0	262
TYCO DURABLE	V7DI8	Baltimore	9	54	1	41	70	0	0	0	0	0	0	0	175
TYCO RESPONDER	V7CY9	Baltimore	3	0	0	0	0	0	0	0	0	0	0	0	3
UBC SAIKI	P3GY9	Seattle	49	6	96	36	39	25	0	0	0	0	0	0	251
UBC SVEA	P3JA8	Seattle	39	29	31	37	64	28	0	0	0	0	0	0	228
UNITED SPIRIT	ELYB2	Seattle	52	70	66	41	77	71	0	0	0	0	0	0	377
USCGC ACUSHNET WMEC 167	NNHA	Kodiak	5	0	0	0	0	0	0	0	0	0	0	0	5
USCGC EAGLE	NRCB	Kodiak	0	0	0	0	6	0	0	0	0	0	0	0	6
USCGC HEALY	NEPP	Seattle	0	0	0	0	14	120	0	0	0	0	0	0	134

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Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
USCGC MACKINAW	NRKP	Chicago	5	0	3	0	0	0	0	0	0	0	0	0	8
USCGC POLAR STAR	NBTM	Seattle	53	150	47	0	0	0	0	0	0	0	0	0	250
USCGC SPAR	NJAR	Kodiak	1	13	0	1	0	0	0	0	0	0	0	0	15
VALENCIA BRIDGE	HOUU	Anchorage	73	60	57	60	65	49	0	0	0	0	0	0	364
VANCOUVER BRIDGE	H8FE	Seattle	0	6	19	17	12	13	0	0	0	0	0	0	67
VEENDAM	C6NL6	Miami	23	0	0	0	0	2	0	0	0	0	0	0	25
VIKING STAR	WAS4138	Kodiak	3	4	5	0	8	0	0	0	0	0	0	0	20
VINCENT THOMAS BRIDGE	H3WJ	Seattle	0	0	33	57	53	33	0	0	0	0	0	0	176
VIRGINIA BRIDGE	HOKP	Anchorage	35	30	40	34	44	17	0	0	0	0	0	0	200
VIRGINIAN	KSPH	San Francisco	47	43	0	0	32	0	0	0	0	0	0	0	122
VIRGO VOYAGER	C6FG8	New Orleans	39	4	0	4	24	13	0	0	0	0	0	0	84
VLADIVOSTOK	P3BJ8	Seattle	0	0	0	0	0	61	0	0	0	0	0	0	61
VOLENDAM	PCHM	Anchorage	26	5	20	16	25	11	0	0	0	0	0	0	103
WASHINGTON VOYAGER	KFDB	San Francisco	10	6	4	0	6	7	0	0	0	0	0	0	33
WECOMA	WSD7079	Seattle	77	38	80	99	49	67	0	0	0	0	0	0	410
WESTERDAM	PINX	Miami	2	21	22	2	0	0	0	0	0	0	0	0	47
WESTERN MARINER	WRB9690	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
WESTERN RANGER	WBN3008	Anchorage	6	6	10	3	18	17	0	0	0	0	0	0	60
WESTWARD VENTURE	KHJB	Seattle	0	23	5	70	35	43	0	0	0	0	0	0	176
WESTWOOD ANETTE	C6QO9	Seattle	7	5	2	18	25	11	0	0	0	0	0	0	68
WESTWOOD COLUMBIA	C6SI4	Seattle	32	39	53	41	47	42	0	0	0	0	0	0	254
WESTWOOD MARIANNE	C6QD3	Seattle	30	43	46	52	13	6	0	0	0	0	0	0	190
WESTWOOD OLYMPIA	C6UB2	Seattle	0	30	32	40	26	21	0	0	0	0	0	0	149
WESTWOOD RAINIER	C6SI3	Seattle	11	23	33	28	27	30	0	0	0	0	0	0	152
WESTWOOD VICTORIA	C6SI6	Seattle	44	34	33	34	33	27	0	0	0	0	0	0	205
WILFRED SYKES	WDA2769	Chicago	7	0	10	15	16	13	0	0	0	0	0	0	61
WILSON	WNPD	New Orleans	0	28	34	0	28	34	0	0	0	0	0	0	124
WOLDSTAD	KF001	Kodiak	17	4	18	6	7	51	0	0	0	0	0	0	103
WORLD SPIRIT	ELWG7	Seattle	32	57	52	35	51	50	0	0	0	0	0	0	277
YM GENOVA II	ELVX2	New York City	49	43	66	57	61	52	0	0	0	0	0	0	328
ZAANDAM	PDAN	Miami	0	0	4	6	3	2	0	0	0	0	0	0	15
ZENITH	C6FU3	Miami	14	11	11	13	8	0	0	0	0	0	0	0	57
ZIM HONG KONG	9HGP7	Houston	38	13	0	0	0	0	0	0	0	0	0	0	51
ZIM SHENZHEN	VQUQ4	New York City	0	16	21	37	35	0	0	0	0	0	0	0	109

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TOTAL SHIPS: 656	15,419	14,737	15,740	15,730	16,263	16,404	0	0	0	0	0	0	94,293

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GPO U.S. GOVERNMENT PRINTING OFFICE : 2005 – 765-764

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